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The Canadian Entomologist

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POPULAR AND PRACTICAL ENTOMOLOGY.

THE COTTONWOOD LEAF-MINING BEETLES IN SOUTHERN ALBERTA.

BY E. H. STRICKLAND,
Entomological Branch, Dominion Dept. of Agriculture.

Cottonwoods and other poplars have proved to be the trees best adapted for shade and ornamental purposes on the treeless plains of Southern Alberta and Saskatchewan. It is, therefore, to be regretted that every year the leaves of these beautiful trees are made unsightly by the presence of large blackened areas, which may extend over their entire surface. In some years hardly a leaf on badly attacked trees escapes this disfigurement.

By the middle of June an examination of the cottonwood trees around Lethbridge, Alberta, can hardly fail to reveal the presence of small groups of holes on the underside of the leaves, (Fig. 2) with perhaps a few smaller groups on the upper side also (Fig. 1, A).

A closer examination of these holes shows that they are never more than about 1 mm. in diameter and are polygonal in shape, being bounded by the finer reticulations of the leaf veins. They do not entirely pierce the leaf but extend to the upper epidermis, which appears as a transparent membrane when the leaf is held to the light. After a few weeks they become more circular in outline, and are surrounded with a cork-like growth.

These holes are the feeding punctures of the Cottonwood and the Poplar-leaf-mining beetles (*Zeugophora scutellaris* Suffr. and *Z. abnormis* Lec.).

The former beetle, which we shall consider more especially in this article, is a pretty little species, measuring 4 mm. long, with a bright yellow thorax and with black wing covers. (Fig. 3). This beetle feeds most abundantly on cottonwoods, though it is found sparingly on other poplars.

Weiss and Nicolay* in recording the occurrence of this beetle in New Jersey, where they state that it appeared first in 1919, describe it as a "European Poplar Leaf-miner." We are inclined to doubt whether this species has been imported from Europe. Mr. Criddle tells me that, from the earliest dates upon which he made observations on the cottonwood-infesting insects of Manitoba this beetle has been abundant, especially upon the native cottonwoods in river bottoms. This observation was made in 1903, when very few cottonwoods had been imported into Manitoba from elsewhere, and Mr. Criddle has noticed that the beetles do not spread rapidly to the imported trees. In Alberta our first personal record was made in 1913, but the inhabitants of Lethbridge informed us at the time that, in so far as they had observed, the cottonwood leaves were always more or less disfigured with black blisters.

Zeugophora abnormis is a beetle similar in size to *Z. scutellaris*, but it is entirely black. It is rarely seen on cottonwoods, but it confines its attention chiefly to Balms of Gilead.

*Ento. News, vol. 30, May, 1919.

Life-history and Habits of Z. scutellaris, Suffr.

On about June 15, the adults are found for the first time in the year feeding on cottonwood leaves. From then on to the end of the month their numbers increase rapidly. Although these beetles are apparently strong fliers they do not take readily to wing, but if disturbed they fall to the ground, feigning death. They are usually present in the largest numbers on the smaller leaved varieties of cottonwoods, and are always more numerous on the lee side of the tree than on the exposed. Trees sheltered by houses also suffer more than others.

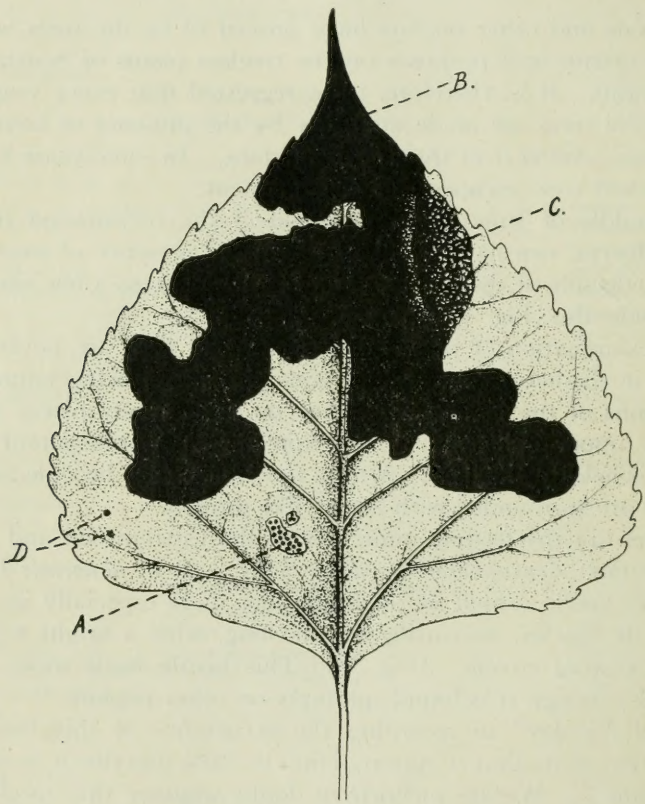

Fig. 1. Cottonwood leaf, upper side, attacked by *Z. scuiellaris*, natural size.
A. Old feeding punctures of adult.
B. Blackened blister made by larva.
C. Epidermis torn away where larva escaped.
D. Darkened areas over eggs which failed to hatch.

By June 26, the sexes are mating freely on the leaves, the female browsing peacefully meanwhile. Before the end of the month numerous eggs can be found in the leaves of trees where the beetles have been feeding. These eggs are yellow or green in colour, elliptical, 1 mm. long by 5 mm wide. They are laid in a small cavity close to the upper epidermis of the leaf. This is connected to a hole on the underside of the leaf by a short diagonal tunnel.

Soon after the egg has been laid the tissues above the cavity turn brown, thus the location of each egg is marked on the upper side of the leaf by a small brown spot about 1 mm in diameter (Fig. 1, D).

From the egg hatches a small, flat larva with a broad head, flattened dorso-

ventrally to such an extent that its anterior margin has a chisel-like edge, from which project a pair of sharp mandibles. (Fig. 4.)

The young larva is very delicate, but it begins at once to enlarge the cavity in which it hatched, feeding only on the palisade cells of the leaf just under the upper epidermis Throughout its life the larva feeds on these cells only and never attacks the lower layer of cells forming the spongy tissues of the leaf. These latter turn black about 24 hours after the overlying layer of palisade cells have been eaten, and this black colour showing through the transparent upper epidermis causes the unsightly disfigurement of attacked leaves, as shown in Fig. 1, B.

The larva is unable at first to eat through the larger veinlets, but the eggs are always laid within half an inch of the leaf margin, where the veins are very fine, thus assuring an ample food supply before the larva is strong enough to tackle the larger veins, the mid-rib of which will in time be eaten through. Often several eggs are laid in one leaf, in one case as many as 13 were counted, but a large percentage fail to hatch. The larvæ are by no means gregarious.

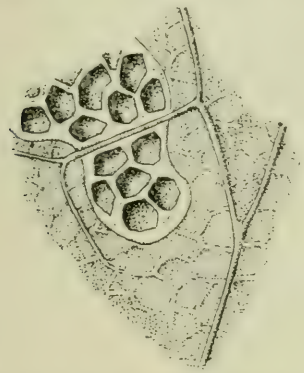

Fig. 2. Old feeding punctures on under side of leaf showing corky tissues developed around punctured area.

Fig. 3. Adult of *Z. scutellaris*, x 7.

When the burrows of two larvæ of approximately equal size join up, these two larvæ may both live if they remain in different areas of the single blister thus formed, but in nearly every case only one survives A large blister covering almost an entire leaf frequently contains one healthy larva only, together with six or seven smaller dead specimens which show no apparent cause for death.

The larvæ are found with the ventral side uppermost. They are legless, and can move as readily on the dorsum as on the venter. While in the blister they are very active and can move rapidly, but when removed from it their progress is very slow

In figure 4 we illustrate a larva of this species in the penultimate stage. The characteristic black markings on the meso- and meta-thoracic and on the abdominal segments are present in all stages of this larva, with the exception of the first and the final stages. They occur both on the dorsum and venter.

By the middle of September the majority of larvæ are mature, measuring 6 mm long. They now break through the thin upper epidermis of the leaf (Fig 1 C) and fall to the ground.

In captivity the escaped larva burrows into the soil to the depth of about 4

inches, where it forms a small elliptical cavity about 1/16" long by 1/2" wide, in which it is found curled up, probably to hibernate as a larva. These cells with their contained larvæ could not be found under infested trees, the majority of which were growing on lawns. Captive specimens were alive and active when distributed on the 12th of November, but were all dead when examined in the following spring.

Life-history and Habits of Z. abnormis Lec.

As previously stated, this is found most abundantly on Balm of Gilead.

Its life-history does not differ much from that given above, though eggs are laid in much larger numbers on individual leaves, as many as 50 having been taken from one leaf. About 28% of the eggs under observation failed to hatch for no apparent reason, and an examination of leaves under natural conditions indicated that this sterility was normal.

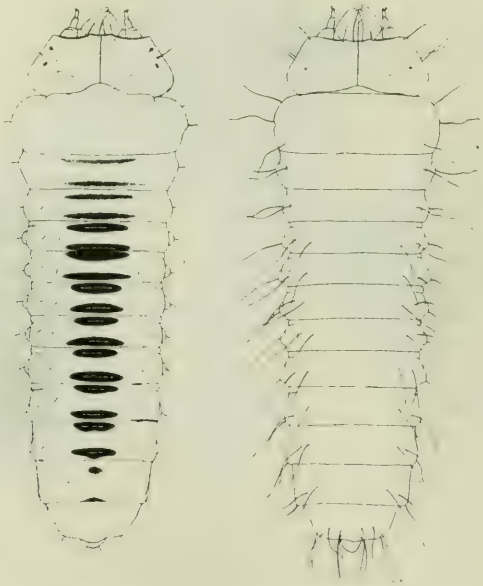

Fig. 4. Larvæ of *Z. scutellaris* and *Z. abnormis*, x 10.

The larvæ are similar to those of *scutellaris*. The main structural differences as shown in Fig. 4, which represents an almost mature larva of each species. Stage II larvæ of *abnormis* have black abdominal markings similar to, though less prominent than, those of *scutellaris*, but from stage III onwards they are entirely missing, and the larva is of a uniform yellowish-green colour.

These larvæ are more gregarious than are those of *scutellaris*, and as many as seven healthy specimens in various stages have been found feeding together in one blister.

The adults attack sheltered trees almost exclusively. The greatest damage is done to foliage 6 to 10 feet from the ground, while the leaves towards the centre of the tree are almost immune from attack.

Though this beetle does not occur annually in such large numbers as does *scutillaris*, it is far more abundant in some years on the comparatively few

Balms of Gilead than is that species. Attacked trees may have the majority of leaves almost completely veined by the feeding of the adults alone.

Control.

Natural.—Egg parasites are numerous, particularly in *Z. abnormis.* A minute Hymenopterous fly was reared from attacked eggs, which has been determined as a Mymarid. Over 40 per cent. of the eggs of *abnormis* examined contained various stages of this parasite.

One specimen of a hymenopterous parasite only was found in large numbers of larvæ examined.

Artificial.—Experiments in spraying infested trees with Lead Arsenate or Paris Green indicated that the latter would prove more successful. It is a more rapid killer, thus reducing oviposition by the females after feeding on it.

The following spray gave good results; Paris green, 1 oz.; slack lime, 4 oz.; water, 10 gallons. Care must be taken that the spray is directed to the underside of the leaves, which necessitates the use of an angle nozzle, and the work must be done as soon as the beetles appear in sufficient numbers to indicate that the trees will suffer later in the season.

It is useless to spray with Paris green when the leaves begin to turn black. The spraying of only a few trees, however well done, in a badly infested area can at best diminish by a small amount the attack on those particular trees. This is due to the flying ability of the beetles. Were the majority of the trees in the district sprayed early in the season most of the beetles would be poisoned while they were feeding on various trees before selecting leaves for oviposition towards the end of June.

THREE NEW CRANE-FLIES FROM EASTERN CANADA.

BY DR. W. G. DIETZ,
Hazleton, Pa.

Late in the fall of 1917, I received from Dr. A. G. Huntsman, Curator of the Atlantic Biological Station, St. Andrews, N.B., a small collection of crane-flies, taken by him at Eastern Harbour, Cape Breton Island, N.S., and Amherst Island, Magdalen Islands, Que. Aside from the three species here described as new, the following species were represented:—*Limnophila inornata* O. S., Eastern Harbour, July 1st, 7 ♂'s; *Limnophila adusta* O. S., Eastern Harbour, July 4, 1 ♀; *Pachyrina pedunculata* Loew, Eastern Harbour, July 1st, 1 ♂; *Pachyrina ferruginea* Fabr., Amherst Is., July 15; Eastern Harbour, July 20, 5 ♂'s, 2 ♀'s; *Tipula angulata* Loew, Eastern Harbour, July 1st, 1 ♂, 2 ♀'s; *Tipula trivittata* Say, Amherst Is., July 15, 1 ♂; *Tipula caloptera* Loew, Eastern Harbour, July 1st, 1 ♀; *Tipula latipennis* Loew (*ottawaensis* Dietz), Amherst Is., July 15, 1 ♂; *Tipula rohweri* Doane, Amherst Is., July 12, 1 ♂; *Tipula inermis* Doane, Amherst Is., July 15, 2 ♂; and *Tipula tephrocephala* Loew, Eastern Harbour, July 1st, 1 ♂, 2 ♀'s.

Limnophila magdalena, n. sp.*

Black with a grayish bloom. Very similar to *Limnophila barberi* Alex. Legs dusky yellow, femora infuscate at apex only.

*Types of the new species are in the author's collection.

Male.—Length 10 mm.; wing 10 mm. Head, mouth-parts, palpi and antennæ black; rostrum short; antennæ short, first joint long with grayish bloom above, second joint broadly subconic, joints three to five a little wider than the following joints and, like the latter, moniliform, outer joints somewhat elongate; the whole antennæ thinly clothed with short, black hairs, shorter than the respective joints. Front and occiput with a grayish bloom and, especially the latter, beset with black hairs. Neck three-quarters the length of front and occiput, transversely subrugulose.

Thorax concolorous, subglabrous; the usual stripes are subfoveate, the median stripe of equal width with an irregular, grayish median line; the interspaces with grayish bloom and a row of short, grayish hairs, directed outwardly; the grayish bloom is more dense on the posterior portion of the præscutum, so as to obscure the limitations of the stripes. Scutum, scutellum and postnotum with grayish bloom. Pleura with grayish bloom, dorso-pleural membrane obscurely yellowish. Halters entirely pale, yellowish. Legs of moderate length and robustness, sordid yellow with black pilosity; coxæ yellowish-brown, darker anteriorly; anterior and middle femora infuscate in apical fifth the posterior in the apical fourth; apices of tibiæ and outer tarsal joints infuscate. Wings light brownish, costal portion more yellowish; veins brown, cord and vein *Cu*, Cu_2 and A_2 seamed with brown; Sc_2 on a line with the base of cell R_2; *Rs* long, slightly curved at its base, R_{2+3} very short, scarcely longer than Sc_2, cross-vein *r* at the tip of R_1; the bases of cells R_{2+3} and R_{4+5} approximately in a line, cell M_1 about as long as its petiole; basal deflection of *Cu*, near the middle of cell *1st* M_2; stigma elongate, quadrate, dark brown.

Abdomen dark brown; tergites two to four, somewhat reddish in the middle portion and thinly clothed with whitish hair. Hypopygium concolorous; the ninth tergite strongely narrowed posteriorly with a small, rounded median emargination. Pleurites large, hairy; the upper appendages dark testaceous, broadening for three-fifths their length, thence narrowed and ending in a denti-form point, the inner margin of the outer two-fifths strongly denticulate; the lower appendage broad in basal portion, and ending in a sharp point.

Holotype.—♂, Amherst Island, Magdalen Islands, Quebec, July 15th, 1917. (A. G. Huntsman).

Distinguished from *L. barberi*, which appears to be its nearest ally, by its larger size, brownish wings, dark brown stigma and veins *Cu* and Cu_2 strongly seamed with fuscous. The front femora are reddish-yellow, with only the apex infuscated.

Limnophila adjuncta, n. sp.

Adusta group. Dark brown, thorax shining; costal cells fuscous; stigma dark brown; apical part of wing infuscate; veins *Cu* and Cu_2 seamed with fuscous.

Length female 9.5 mm.; wing 10 mm.

Head dark fuscous, silvery-gray above; proboscis short, grayish above. Palpi brown. Antennæ short, first joint short, fuscous, joints two to five brownish-yellow, ovoidal, outer joints attenuated, brownish; pilosity of moderate length. A patch of black hair each side of occiput.

Thorax brown, shining; sides and perisutural foveæ grayish-yellow, pollinose. Scutum more distinctly pollinose. Scutellum reddish brown, shining.

Postnotum subopaque, pollinose. Pleura reddish brown, subglabrous with a faint, grayish sheen. Halters pale, club infuscate. Legs slender, sordid yellowish brown; pilosity short, grayish; coxæ and basal part of femora yellowish, tarsi fuscous. Wings light gray, costal cells fuscous, stigma elongate, dark brown, apical portion of wing infuscate, veins *Cu* and *Cu*$_2$ seamed with fuscous. Venation as in *Limnophila terræ-novæ*** Alex.

Abdomen yellowish brown, with a fine, pale pubescense; venter yellowish. Ovipositor brown, valves slender, curved upwards, apices pale.

Holotype.—♀, Eastern Harbour, Cape Breton Islands, July 17th, 1917. (A. G. Huntsman).

A very close ally of *L. terræ-novæ*, with the description of which it agrees in all points, save that the cord and cross-veins are not seamed with fuscous; the *Rs* is longer than cell *1st M*$_2$—equal in *terræ-novæ*—and subangulate at the base, with a short stump of a vein. Cell *R*$_2$ is very narrow in its basal half, whereas it widens from the base in *terræ-novæ*.

Tipula huntsmaniana, n. sp.

Very similar to *Tipula angulata* Loew. Flagellar joints of antennæ bicoloured. The pale, angulate fascia incomplete, scarcely reaching the middle of cell *M*$_3$; base of wing yellowish.

Male.—Length 13 mm.; wing 13.5 mm.

Head dull yellow; palpi yellowish brown, last joint dark brown and shorter than the preceding joints together. Frontal prolongation and rostrum concolorous, with a light, whitish pollinosity. Nasus short. Antennæ of moderate length, the three basal joints yellowish, joints three to ten yellowish, blackish at the base, outer joints brown. Frontal tubercle with impressed longitudinal line. Occiput with pale, yellowish-gray hairs.

Thorax yellowish-gray, dull. Pronotum with dark, median spot. Præscutal stripes darker brown, ill defined; the median stripe narrowed posteriorly with a not sharply limited, median paler line, scutum dull brown, posterior border paler; scutellum and postnotum luteous, with ill-defined, median darker line. Pleura yellowish white, subsericeous; pleuro-dorsal membrane dull yellow. Halters pale, club dark brown. Legs slender, dull, yellow; pilosity very short, blackish; coxæ yellowish white, sericeous; femora and tibiæ infuscate at the tip, the latter a trifle longer than the metatarsus; tarsi fuscous. Wings with the pattern of *T. angulata*, but the pale, angulate fascia becomes narrowed in cell *M*$_2$ and does not extend beyond the middle of the latter cell.

Basal tergites of abdomen yellowish, becoming yellowish brown to fuscous posteriorly, with darker, median vitta; lateral margin of tergites paler. Venter similar to tergum. Eighth sternite rounded. Hypopygium yellowish brown; ninth tergite subquadrate with U-shaped median emargination, the lateral margin of the latter ends in a sharp point. Pleural suture entire; the pleurite transversely oval, the outer appendage narrow, erect, pointed, curved somewhat backward, hairy; the inner appendages consist of perpendicular plates, broadly rounded basally, narrowed upwardly and ending just below the free margin of the ninth tergite; ninth sternite with a deep, U-shaped emargination.

**Journal New York Entomological Society, vol XXIV, Pl. 8, fig. 7.

Holotype.—♂, Eastern Harbour, Cape Breton Island, N.S., Canada. (A. G. Huntsman).

A close ally also of *Tipula entomophthorae*[1] Alex., which it resembles in hypopygial structures and from which it is differentiated in the bicolored, flagellar segments and the ill-defined, thoracic stripes. It differs from *Tipula angulata* Loew and *Tipula huron* Alex.[2], in the angulate fascia not rendering the posterior wing-margin. *Tipula texensis* Alex.[3], has the pale fascia before the stigma.

Respectfully dedicated to Dr. A. G. Huntsman.

A NEW USE FOR THE AEROPLANE.

The Department of Agriculture at Ottawa has discovered a new use for the aeroplane. The Entomological Branch is investigating the mosquito in the Lower Fraser Valley in British Columbia. By using the aeroplane, the country can be surveyed in order to map out the swampy areas and other breeding places that are readily located in photographs taken from over head, according to a statement by Dr. C. Gordon Hewitt, Dominion Entomologist, that appears in the October Agricultural Gazette. The aeroplane was used in making a comprehensive survey of the complicated water system of the Fraser River and the adjacent bodies of permanent and temporary water in that district. A flight reported by Dr. Hewitt has demonstrated the possibility of using this machine also for making surveys of timber that is being killed or has already been destroyed by various insects. Its use, it is believed, will help very greatly in the entomological work with various insects being carried on by the Federal Department of Agriculture.

THE HOUSE CENTIPEDE, CERMATIA FORCEPS RAF. IN MONTREAL.

A specimen of this Myriapod was found in a classroom of Goltman's Business College on St. Lawrence Boulevard (corner of Sherbrooke Street) on July 22, 1919, and was sent by Mr. Robert Goltman to me for the Redpath Museum where it was seen by Mr. A. F. Winn. It was kept alive feeding slightly upon house-flies until August 19th, when, by an unfortunate accident, it escaped. The species is mentioned in Comstock's Manual (p. 46) as "often found running on the walls of houses, especially in the Southern States." It was observed in Albany from 1870 onwards by J. A. Lintner, but this is believed to be the first record of its occurrence in Montreal. Lintner's account of its cleaning habits was confirmed; when cleaning the hinder limbs the body is bent sideways. The appendages of one side are cleaned in succession, beginning with the antenna.

The occurrence of this Myriapod in Canada has been recorded only once previously, a specimen having been taken in Toronto. (Can. Ent., XLVI, p. 219, 1914.) ARTHUR WILLEY.

Two other specimens of the house centipede from Toronto have been sent me to for determination since the record cited by Prof. Willey was published.

E.M.W.

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1. Can. Ent., Vol. L, p. 385.
2. Ibid, Vol. L, p., 66.
3. Ibid, Vol. XLVIII, p. 48.

THE BEE GENUS EMPHOR IN SOUTH AMERICA.

BY C. SCHROTTKY,
Pto. Bertoni, Paraguay.

Mr. J. Vachal (Rev. Ent. Caen., Vol. XXVIII, p. 23, 24) cites 3 species of *Emphor* from Argentina: 1, *E. fructifer* (Holmbg.); 2, *E. tricolor* (Friese), and 3, *E. bifax* Vach. The first is at the same time the type of the genus *Teleutemnesta* Holmbg., and the second was described as an *Ancyloscelis*. Vachal himself regards *Emphor* as a subgenus of *Ancyloscelis;* but this standpoint is not to be discussed here. Changing his term "subgenus" into "genus," the question is left open whether he was correct in synonymizing *Teleutemnesta* with *Emphor*, or not. As I had the occasion to see some specimens of a representative of this group in the collection of Mr. A. de Winkelried, Bertoni, I think it useful to give a detailed description of them as well as some remarks on the group as a whole. For, if Mr. Vachal's views are correct, the genus would have a singular distribution; a few species in Argentina and one in the Eastern United States. The specimens mentioned above came from Santa Fé, Argentina, and cannot be referred to any of the three species cited by Vachal. There is a description of *Ptilothrix tricolor* (Friese) given by Brèthes* (Anal. Mus. Buenos Aires, Vol. XX, pl. 10, p. 295), based apparently on the same insect as the Santa Fé bees, but, as it seems, not on that described by Friese as *Ancyloscelis tricolor*. There are too many differences between the description of the latter and the Santa Fé bees, so these are treated here as a new species: *Emphor opuntiæ*. Surely they are at least congeneric and with the same habits as *tricolor*. Mr. A. C. Jensen Haarup states that *tricolor* "is rarer than the preceding"—*Ancyloscelis nigerrima*—"and similarly a cactus-insect" (Flora og Fauna, 1908, p. 103). According to Mr. Joergensen who observed both *tricolor* and *nigerrima* at Mendoza, Argentina, they are one and the same species; the few red hairs on the segments of *tricolor* are soon lost or decoloured and thus the insect becomes *nigerrima*. There are no plastic differences between them (Zool. Jahrb., Vol. XXIX, 1912, Abt. f. Syst. p. 157).

Joergensen says that the bee provides its nest with a tube above the soil, a behaviour not observed of any other bee from Mendoza. Among the flowers visited he likewise cites an *Opuntia* (1. c.). The North-American species, *E. bombiformis* (Cress.), on the contrary, was found on flowers of *Ipomœa* and *Hibiscus*, as far as I know.

The species described by E. L. Holmberg as *Teleutemnesta fructifera* is surely also congeneric, although there seem to exist slight differences in the venation of the wings. Holmberg says that the second cubital cell is smaller than the first or third, with the first recurrent nervure a trifle behind its middle. Vachal states that the second cubital cell is almost as large as the first or third, with the first recurrent nervure between its middle and apex, nearer to its middle, however. In *opuntiæ* the second cubital cell is scarcely half the length of the first and not more than ⅔ of the third; the first recurrent nervure enters in the female almost in the middle of the cell, in the male between middle and apex. In *bombiformis* finally, the second cubital cell is described as about ⅔ the length

*Brèthes considers Emphor and part of Teleutemnesta as synonyms of Ptilothrix Sm. (Bull. Soc. Ent. France, 1910, p. 212). They are certainly related but not identical if the figures given by F. Smith are correct.

of the first. In *opuntiæ* the claws have a short median tooth in the female, a long one in the male, thus in the latter sex they appear almost cleft. In both sexes there are no pulvilli; of the other Argentine species no references are given in this respect.

Emphor opuntiæ, n. sp.

Female.—Black, 13 mm. Head as broad as thorax. Face clothed with dirty white pubescence, that on vertex black. Clypeus nude, convex, its anterior margin slightly depressed, covered not very closely with rather large punctures; its hinder margins oblique and clothed with whitish pubescence. Mandibles with fine yellowish pile at base, reaching the eyes. Vertex quite closely punctured with rather small punctures. Antennæ short, black; scape minutely punctured.

Thorax covered with grayish hairs; a transverse line of fuscous hairs behind the anterior margin of the mesonotum, with short triangular projections backwards on the parapsidal region; another transverse band of fuscous hairs on the anterior margin of scutellum. Tubercles with fuscous hairs. Sternum and lower part of pleuræ densely covered with short black hairs. Mesonotum and scutellum with quite large punctures. Basal area of propodeum almost bare, covered with fine shallow punctures and with a slight median depression at base. Enclosure of basal area smooth and shining, the rest of propodeum densily punctured. Pleuræ equally covered with close punctures.

Abdomen.—First two dorsal segments covered with very short white hairs, becoming closer and longer at sides and on apical margins, forming fasciæ which become gradually broader towards the sides; that on second segment is white only in the middle, towards the sides it becomes more and more yellowish. The following two segments are clothed at base with short scattered black hairs. the marginal fasciæ are formed by longer and closer hairs, orange-yellow and broader at sides, paler and narrower in the middle. Fifth segment only at sides with orange-yellow hairs, those at base and on apical margin fuscous. Sixth segment entirely covered with fuscous hairs, except the naked pygidial plate; this opaque, tapering towards apex, longer than broad at base. All segments punctured; the punctures small and scattered at basal segments, become gradually closer and larger towards apex. Ventral segments 2–5 with fringes of long, orange-yellow hairs; the hairs on second segment scattered, on fifth very close. Punctures on ventral segments closer at apical margins than at base.

Wings.—Subhyaline, nervures dark brown, stigma same. First cubital cell longer than third; second pentagonal, narrowed above, scarcely half the surface of first and about $\frac{2}{3}$ of third, with the first recurrent nervure a little behind its middle. Origin of cubital nervure and of first recurrent nervure equally distant from base of wing. Tegulæ almost black, microscopically punctured.

Legs.—Clothed with long, fuscous hairs. Femora dark reddish brown. Tibiæ almost black; tarsi ferrugineous. Tibial spurs reddish brown, those on posterior pair hooked at apex. Claws slender with an acute median tooth. No pulvilli.

Male.—General appearance similar to female, but larger (14 mm.), on abdomen and legs less densely haired.

Head.—Clothed with long grayish white pubescence; no dark hairs on vertex. Punctures on clypeus much closer than in female. Labrum very large, closely punctured, its apical margin incrassate, smooth and shining, clothed with a few yellowish hairs. Antennæ short; second joint of flagellum longer than third and fourth united; last joint a little compressed.

Thorax.—Entirely covered with dirty white pubescence, even the sternum, only on scutellum the hairs are brownish. Propodeum with longer and denser hairs as in female, the basal area concealed under the long pubescence.

Abdomen.—As in female, but the hairs on sides and apical margins much shorter, hence the fasciæ narrower and weaker, especially when seen from behind; fifth and sixth segments with orange-yellow fasciæ, and undefinited patches at sides basally formed by fuscous hairs; seventh segment with dense fuscous hairs.

Wings.—The origin of the cubital nervure a trifle nearer to base of wing than that of first recurrent nervure; this entering second cubital cell between middle and apex, closer to its middle.

Legs.—Stouter than in female, less hairy, the hairs pale. Hind coxæ very thick, almost without punctures, but clothed with fine, long, yellowish hairs. Claws with the median tooth longer than in female, almost reaching tip of claws.

Argentina; Santa Fé.

Female.—(Type) Dec. 30, 1910, on *Opuntia monacantha* Haw.

Male.—(Genotype). Same locality, without other date.

From *Teleutemnesta* s. *Emphor fructifer* (only the female is described by Holmberg) it differs by the mandibles not spotted with yellow; by the pubescence of thorax which is gray mixed with a few fuscous hairs in *fructifer*. The punctures on thorax of *opuntiæ* are neither very fine nor very close as in Holmberg's species. The scopa is fuscous in *opuntiæ*, fulvous in *fructifer;* the latter has the four basal segments of abdomen fringed with orange-yellow fasciæ.

The males described by Vachal as *fructifer* are perhaps another species as they are unusually small (10–11 mm.), while in the other known species the male is equal in size to female or even larger. From these so-called *fructifer* the new species differs by the tubercles being clothed with pale hairs as well as the anterior pair of legs and the femora of the remaining. All these are clothed with black hairs in Vachal's specimens.

E. tricolor (Friese) female has no transverse fasciæ of dark hairs on mesonotum and scutellum, but many gray hairs which replace sometimes all the black pubescence; the abdominal segments 2 and 3 have whitish fasciæ, and only the sides of third and fourth segments have yellowish fasciæ. Moreover, it is smaller (12 mm. long, 4 mm. late), against 13 and 4,5 mm. in *opuntiæ*.

The male of *E. tricolor* is smaller and has yellowish hairs only at sides of abdominal segments 3 and 4. The description given by Friese is very incomplete and not fit for comparison.

E. bifax Vach., judging from the very short description, is quite another insect.

Ptilothrix megasoma Brèthes seems to belong to *Emphor* too; it is a large bee (15 mm.) from Mendoza, and differs considerably from *opuntiæ*.

NOTES ON SCUTELLEROIDEA FROM VANCOUVER ISLAND.

BY DAYTON STONER,
Iowa City, Iowa.

During the latter part of the summer of 1913 the writer and Mrs. Stoner spent a few weeks at the Dominion Pacific Coast Biological Station, which is located on Departure Bay some three miles north of the city of Nanaimo on Vancouver Island. The principal object of the trip was to collect and investigate the marine fauna of the region and, due to the kindness of Dr. C. M. Fraser, Director of the Station, this phase of our work was exceedingly profitable. During our stay a few short excursions were made for the purpose of collecting insects. Only general collecting was attempted, and as a result the number of Scutelleroidea taken was not large.

Practically all the collecting was done within a radius of three miles of the Station, which is surrounded on the landward side by a dense growth of lofty coniferous trees. Here and there are more or less open places where the sun penetrates and where blue grass, timothy and clover grow to some extent. Further inland are pastures and open cultivated areas with an occasional marsh or lake.

The purpose of this brief article is simply to make available definite locality records for the species taken.

List of Species.

Family Scutelleridæ.

Homaemus aeneifrons (Say).

Not a common form in the region, less than a half dozen specimens having been taken on August 26 and September 4.

Eurygaster alternatus (Say).

This seemed to be the commonest scutellerid of the region, and it was found on the high grass around the edges of pastures, August 25 and 26.

Family Pentatomidæ.

Peribalus limbolarius (Stal).

But two specimens of this form were taken on August 26 and September 1.

Chlorochroa uhleri (Stal).

One of the most abundant species of the region. Adults, and nymphs in third and fourth instars were taken between August 25 and September 12. Toward the middle of September these bugs often congregated in numbers upon the blossoms of spiræa (*Spiræa* sp.), and on one occasion twelve individuals were photographed on a single blossom of this plant.

Euschistus euschistoides (Voll.)

Numerous examples were taken between August 28 and September 6 in pastures and from partly-cleared areas in the woods where a little blue grass and clover were making an attempt to gain a foothold.

Euschistus conspersus (Uhler)

A long series of specimens is at hand bearing inclusive dates from August 24 to September 12. This form was common on the long grass in pastures where cattle were feeding and in the high grass around the borders of such fields. The species was also taken on Gabriola Island. This rocky island lies in the Strait of Georgia several miles south of Departure Bay; it is about ten miles in

length, very narrow, and a good deal of its area is covered by pine and eucalyptus trees. Not many insects were taken on the island. This pentatomid was also taken on Brandon Island, a very small rocky island in Departure Bay, and perhaps a hundred yards from the Station. Only a very limited amount of vegetation is supported by the soil, and at high tide the island is pretty well covered by water. The bugs probably do not breed upon these small, rocky islands, of which there are a great many in the region, but are probably blown out or fly out from the main land.

Cosmopepla conspicillaris (Dall)

Several specimens of this species were usually taken on each collecting trip. They were found more commonly in semi-cultivated areas. All the specimens are uniformly marked so far as colour pattern is concerned, but the transverse band across the pronotum varies in intensity from pale yellowish white in some specimens to deep reddish orange in others.

Eysarcoris intergressus (Uhler).

But a single specimen of this species, a female taken September 1, is represented in our material. This specimen is a little darker and has a more bronzed appearance than the other specimens in my collection, which are from Colorado and Washington. I believe that the species has not before been recorded from the latter State.

Thyanta custator (Fabr.).

This was the most abundant pentatomid of the region, and was taken on every collecting excursion between August 26 and September 12. Both pale yellowish and the typical greenish individuals are among the lot, but in none is the sanguineous band across the pronotum well marked, although it is evident in some of the pale forms. This bug was common in open places in the woods near the Station where a little clover and timothy were growing. Two specimens were also taken on Brandon Island September 1.

Banasa dimidiata (Say).

Seven specimens of this species were taken by us between September 1 and 6. All have the general body colour, a reddish brown with the anterior half the pronotum yellowish green. In none of the examples is the second segment of the antennæ more than one-half the length of the third.

Elasmostethus cruciatus (Say).

But one specimen of this species, a typically coloured female was taken on September 1.

Podisus serieventris (Uhler).

One adult female, taken September 1 and a nymph in the fourth instar constitute our only records for the species. The adult example is dark reddish in colour with the tips of the humeri and a spot on each hemelytron black.

A CORRECTION.

In my article entitled "Notes on Thysanoptera from British Columbia," issued in the Canadian Entomologist, Vol. LI, pages 181–190; on page 182 line 28 Plate XVI, fig. 1 should read Plate XVI, fig. 2, and on page 184, line 24 Plate XVI, fig. 2 should read Plate XVI, fig. 1.

R. C. Treherne,
Entomological Branch, Dominion Department of Agriculture.

NOTES ON ISCHYRUS QUADRIPUNCTATUS OLIV., BRED FROM FUNGUS.

BY HARRY B. WEISS,
New Brunswick, N.J.

On July 10 at Union (near Elizabeth), N.J., several partly grown larvæ and adults of this species were taken while feeding on a species of *Poria* growing on an old elm stump. Most of the larvæ were feeding openly on the surface of the fungus, while others were partly buried in it. Some of the larvæ were caged together with a supply of food, and these continued to feed up until July 16, by which time all of the fungus had been eaten. They then burrowed into the old, decayed bark and constructed cells in which they pupated. By July 20 all had transformed into pupæ, and on July 27 the first adult emerged, fully coloured.

According to Stevens,[1] members of the fungus genus *Poria* may be recognized by the sporophore being entirely resupinate, often widely extended, the base leathery to punky and the pores small and rounded covering almost the entire surface.

Full grown Larva.—Length 9 mm. Width across mesothorax 2.5 mm. Elongate, subcylindrical, abdomen tapering slightly toward anal segment, segmentation distinct; antennæ three-jointed, subcylindrical, second joint longest and bearing minute third joint, which is tipped with a hair; prothorax twice as long as mesothorax; meso- and metathorax subequal in length; abdominal segments subequal in length. Colour white except for head which is dark and the dark brown to black, subrectangular, transverse, chitinized areas on the dorsal surfaces of the thoracic and abdominal segments, giving the dorsal surface a transverse banded appearance. Median, V-shaped, white line on head with point of V touching anterior, prothoracic edge; median, white, dorsal line on thoracic and abdominal segments; on either side of the median, dorsal line on prothorax is a wider, somewhat curved, white line, which taken with median line divides the dark area into four parts, the lateral parts being subcircular; dark areas on dorsal surfaces of head, thorax and abdomen bear numerous white hairs with prominent, tuberculate, dark bases becoming largest on the last five or six abdominal segments; dorsal surface of last abdominal segment bears two prominent, spine like tubercles curved anteriorly, these tubercles bear smaller tubercles each tipped with a white hair; lateral surfaces of thoracic and abdominal segments bear several hairs with tuberculate bases; tubercles on lateral portion of head posterior to antennæ are the largest; ventral surface and legs white and sparsely hairy; spiracles on second thoracic and abdominal segments one to eight.

Pupa.—Length 8.5 mm. Width across thorax 3.2 mm. White, elongate-oval, rounded anteriorly, gradually tapering posteriorly; head, thorax and wing-cases, especially prothorax, covered with minute, reddish-brown tubercles each bearing a long, white, spine-like hair; transverse patches of similar tubercles on dorsal and ventral abdominal segments, more numerous on dorsal surface; lateral surface of each abdominal segment bears two groups of slightly longer tubercles each bearing a long hair; lateral spine-like hairs are longer than other

1. Stevens, F. L., The Fungi Which Cause Plant Disease, 1913.

body hairs; anterior, median, dorsal surface of prothorax bears a pair of prominent tubercles, each tubercle bearing two reddish-brown, prominent, posteriorly directed, curved spines (giving an antler-like effect); posterior, median, dorsal surface of prothorax bears a pair of smaller tubercles each with two posteriorly directed spines, the anterior spines being strongly curved; mesothorax bears a pair of median tubercles each with a large, posteriorly directed spine and a smaller, perpendicular one anterior to it; metathorax bears pair of tubercles each with a posteriorly directed spine; bases of thoracic tubercles all bear smaller, reddish-brown tubercles, those on meso- and metathorax being arranged in a circle; median, dorsal portions of abdominal segments one to eight bear eight, large spines with tuberculate bases, arranged in a double row of four each, the anterior four usually being anteriorly directed and the posterior four being posteriorly directed; on last three abdominal segments these spines become closer together and appear to radiate somewhat; last abdominal segment bears a dorsal pair of prominent, anteriorly directed, curved, chitinous spines; all spines reddish brown; fewer tuberculate, spine-like hairs on ventral surface.

Adult.—Ischyrus quadripunctatus. This was described by Olivier in 1808 (Enc. Meth. Ins. VI, 437). Blatchley[2] states that it is frequent throughout Indiana, Jan. 21–Dec. 8, being gregarious in winter and hibernating beneath bark and logs, also it is often found at sap in early spring and on fungi in the summer. Smith[3] records it only from Caldwell and Westville in New Jersey, but it occurs in various other places in the state. Chagnon[4] lists it from Quebec, Canada. Beutenmuller in his "Bibliographical Catalogue of the Described Transformations of North American Coleoptera"[5] gives the following single reference to the larva, "1855, Larva (Fig.) Chapuis et Candeze. Mem. Soc. Sc. Liege VIII, 22 pl.

NOTE ON THE DISTRIBUTION OF *ATTEVA AUREA* FITCH.

BY FRANK M. GIBSON, PH. D.,
Baltimore, Md.

This moth was first described by Asa Fitch in his Third Report on the noxious, beneficial and other insects of the State of New York, but he does not report its occurrence in that State, having prepared his description from a specimen sent him from Savannah, Georgia. Dyar gives its habitat as the Southern States; Holland as the southern portion of the region covered by his *Moth Book*, from the Gulf States southward and westward, into Mexico and lands still further south.

In July of the present year, I found in this city, feeding upon ailanthus, certain larvæ which were unknown to me. They pupated while suspended in a loose, irregular net spun among the leaves, and emerged July 25–28. I sent one of these to Dr. Barnes, who kindly confirmed my identification of it, and stated that he had raised the moth at Decatur, Illinois, on ailanthus, and that Mr. Poling had bred it at Quincy in the same State. This would indicate a far wider distribution for it than that assigned by Holland and Dyar.

2. Blatchley, W. S., Coleoptera of Indiana, p. 546.
3. Smith, J. B., Insects of N. J. (N. J. St. Mus. Rept., 1909).
4. Chagnon, G., Coleoptera of Quebec.
5. Jour. N. Y. Micros. Soc., Vol. VII, No. 1, 1891.

THE ENOMOLOGICAL SOCIETY OF AMERICA, ANNUAL MEETING.

The Fourteenth Annual Meeting of the Entomological Society of America was held at St. Louis, Mo., on December 29 and 30, 1919. The chair was occupied by the President, Professor J. G. Needham, and there was a goodly attendance of members present.

The following is a list of the papers read at the meeting:—

Tropisms in Insect Behaviour—An Enquiry. C. H. Turner.

The Food Plants and Distribution of Certain Calendra Species. A. F. Satterthwaite.

The Biology of the Carabid Genera Brachynus, Galerita and Chlaenius. J. L. King.

The Influence of Environmental Factors in the Hatching of the Eggs of Aphis Prunifolia, Fitch. Alvah Peterson.

Insects of the Between-Tide Zone of the North Carolina Coast. Z. P. Metcalf and Herbert Osborn.

Observations on Canadian Ticks. Seymour Hadwen.

Notes on the Mouth-parts of Aradidæ. C. S. Spooner.

The Genitalia of the Syrphidæ. C. L. Metcalf.

Observations on the Genitalia of Lachnosterna. Wm. P. Hays and J. W. McCulloch.

Notes on the Leafhoppers of the Subfamily Gyponinæ. E. D. Ball.

The Production of Abnormal Larvæ, Pupæ and Adult Beetles by Gas Secreted by the Confused Flour Beetle (*Tribolium confusum*). R. N. Chapman.

Serum Diagnosis and Insect Relationship. Robt. D. Glasgow and Josephine Burns Glasgow.

The Syrphid Fly (*Mesogramma marginatum*) Caught By Flowers of the Dogbane. R. C. Osburn.

A special feature of the meeting was a symposium on "The Life Cycle of Insects," which aimed to give a "bird's-eye view" of the entire subject. The scope attempted was as follows: 1. Facts as to form changes, broods, length of life, moults. 2. Significance of facts in relation to nature of environment, reproductive capacity, rate and times of growth, habits, etc. Briefest possible statement of what each group best illustrates in relation to the life cycle.

The subject was presented by groups as follows:—Apterygote Insects, J. W. Folsom; Orthopteroids (sens. lat.), E. M. Walker; Hemiptera, (excl 4), E. D. Ball; Aphids and Coccids, Miss Edith M. Patch; Neuropteroids having complete metamorphosis, and Lepidoptera, S. L. Fracker; Coleoptera, (including Strepsiptera), R. N. Chapman; Diptera, C. L. Metcalf; Hymenoptera, T. D. A. Cockerell. Concluding remarks on the general subject were made by Prof. S. A. Forbes.

The Annual Address was delivered on Tuesday evening by Dr. W. J. Holland, Director of the Carnegie Museum, Pittsburgh. His subject was "The Evolution of Entomological Science in North America."

VARIATIONS OF BUPRESTIS VIRIDISUTURALIS, NICOLAY & WEISS.

BY RICHARD T. GARNETT,
Oakland, California.

In my collection, although there are but two perfect specimens of this species, I have the elytra of twenty-nine other specimens. This is a large enough series, I should judge, to give the general trend of markings in this very variable species.

In the plate given by Nicolay and Weiss of this species the male is represented with a thin sutural marking and about two-thirds the distance from the anterior edge a triangular dark marking on the disc extending from the suture as a base. Of the five male elytra that I have, one is like their figure. The other four have only an extremely thin sutural marking with a small humeral spot in one (Fig. 8).

Of the twenty-six female elytra there is but one that I have that approaches exactitude with that of the plate given by Nicolay and Weiss. I have them varying from the nearly all yellow elytra (Fig. 2) to the half dark colouring of (Fig. 10). Figures 4 and 5 show how the sutural markings are connected or tend to become connected (Fg. 4) with the lateral markings. Figure 4 also shows the maximum number of spots present on any one set of elytra in my series.

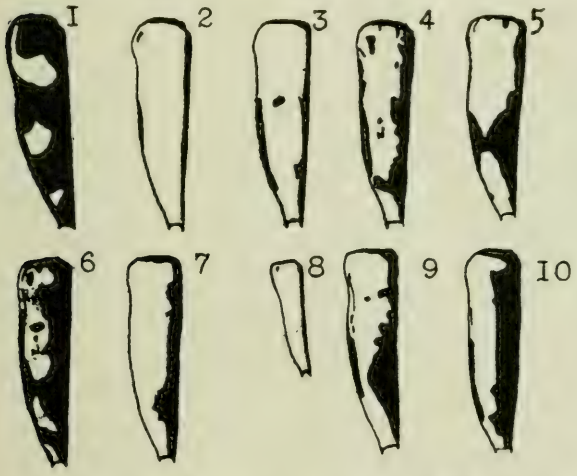

Fig. 5. 1.—Elytron of *B. gibbsii* Lec.: 2, 3. 4, 5, 7, 9. 10.—Elytra of *B. viridisuturalis* Nicolay & Weiss. (Female); 6.—Composite elytron of variations of *B. viridisuturalis* N. & W.; 8.—Elytron of *B. viridisuturalis* N. & W. (Male).

One thing that I examined especially was the colour; and, as my series for the most part had died some time before collection, I used chloroform and a moistening box to bring back the natural colour in case the colour present was not the natural one. This failed, however, to bring any results, and as far as I can see the colour of the majority of my *viridisuturalis*, that is, of the dark markings along the suture, is identical with that of the dark markings of *B. gibbsii* Lec., a metallic greenish purple.

Going a little further I took a composite of all the markings found in my series (Fig. 6) to compare it with the markings found in my specimens of *B. gibbsii* (Fig. 1). There are some points of similarity, as can be seen in the humeral lunule and the almost completely divided median spot. Perhaps some day a specimen will be found with similar markings, for if various specimens may have such varied markings it is reasonable to believe that some specimens may have a combination of these markings.

Thus I believe it may be safely stated that while *B. viridisuturalis* is certainly a distinct species it may simulate in markings *B. gibbsii* somewhat, and

also in the colouring, with the exception that there is never orange on the elytra of *B. viridisuturalis* as far as I have observed them. The females of *B. viridisuturalis* are also usually 1 or 2 mm. longer than *B. gibbsii*.

My *B. gibbsii* were taken in Trinity Co., Calif., breeding in oak, (a fallen log), while my specimens of the other were taken from dead wood of a live standing cottonwood at Oro Grande, San Bernardino Co., Calif. *Gibbsii* I believe breeds only in oak (vide Leach & Van Dyke), while Van Dyke says that so far as he knows, *B. viridisuturalis* is confined to the cottonwoods.

NOTES ON MYCOTRETUS PULCHRA, SAY AND ITS FUNGOUS HOST.

BY HARRY B. WEISS,
New Brunswick, N.J.

This member of the family Erotylidæ was found breeding in *Polyporus chioneus* at Monmouth Junction, N.J., on September 8. At this time larvæ, pupæ and several adults were present, with the larvæ most plentiful. The infested fungus was moved to the laboratory and kept moist by being placed close to a wet sponge. The larvæ continued to feed in the context of the fungus until they were full grown, when they then entered the pores of the sponge and pupated, the sponge being rather dry at that time. From this it appears likely that pupation in the field takes place in the wood to which the fungus is attached. Under laboratory conditions the pupal stage required from ten to twelve days during the last half of September. The appearance of the adults this late in the season indicates that hibernation takes place in this stage.

Polyporus chioneus Fries[1] has a soft and watery pileus when fresh, and occurs on the dead wood of deciduous and coniferous trees. Numerous specimens of other fungi were examined during the past year, but *Mycotretus pulchra* Say was found associated only with *chioneus*. However, it is extremely probable that other watery forms such as *P. borealis*, *P. albellus*, etc., are attacked.

Full-grown Larva.—Length 6.2 mm. Width 1.5 mm. Whitish, head often slightly browned; subcylindrical, prothorax twice as long as mesothorax; mesothorax and remaining body segments except last two are subequal in length; last two segments shorter; head, prothorax, and last two abdominal segments narrower than remaining segments which are subequal in width (some larvæ have expanded grub like abdomens); body and legs sparsely hairy, hairs short; abdominal spiracles project slightly from the body appearing as minute, somewhat blunt spines.

Pupa.—Length 4.4 mm. Width across wing-cases 1.9 mm. Whitish, suboval, rounded anteriorly, tapering to a point posteriorly; head, prothorax and wing-cases thickly clothed with spines each bearing a long hair; fewer spines on leg-cases and ventral abdominal segments; anterior edge of prothorax bears a pair of median irregularly shaped knob-like tubercles each bearing several spines; smaller, somewhat similar median pairs of tubercles on posterior edges of pro-, meso- and metathorax; each abdominal segment bears a transverse dorsal row of spines with a rosette-like group of five or six at the lateral edge, these rows continued on the ventral surface but with fewer spines; body terminated dorsally by two comparatively long, curved spines and ventrally by

1. Identified by Mr. Erdman West.

two lateral, rosette-like groups of spines; abdominal spines directed posteriorly; all spines bearing long hairs; entire dorsal surface bears smaller spines intermixed with those mentioned above.

Adult.—Mycotretus pulchra. This was described by Say in 1826 (Jour. Phil. Acad. Nat. Sci. V, 301; ibid. II, 345) under the generic name *Tritoma*. It is about 3 to 3.5 mm., long, ovate, with the head, thorax and scutellum black, the elytra red with the apical third obliquely black, the black extending forward on the sides almost to the humeri. The head and thorax are finely and sparsely punctured, the punctures of elytral striæ are fine, the intervals finely punctate.

Smith[2] records it from Hudson County and Woodside, N.J., with the statement that it was once common. Blatchley[3] states that it is frequent in Marion, Vigo, Knox and Posey Counties, Indiana, April 9–June 19, and in Chagnon's Coleoptera of Quebec[4] it is listed from Rouville Co., June, Montreal Isl., June and Laval Co., August.

A NEW GENUS AND SPECIES OF APHID FROM JAPAN. (HEM.)

BY RYOICHI TAKAHASHI,
Forest Experiment Station, Meguro, Tokyo, Japan.

This interesting aphid, which is found in the leaves of *Podocarpus macrophylla*, is rather inactive in habit. Both winged and wingless forms appear in May and later, in the second and subsequent generations. The sexuparæ are wingless, but most interesting is the fact that the oviparous female, as well as the male, is winged, these forms appearing during the month of September. As is common for species belonging to the Siphonophorina, wingless viviparous females may give birth to both winged and wingless progeny, but winged females produce only wingless forms.

Neophyllaphis, new genus.

This genus is closely related to *Phyllaphis* Koch, but differs from it as follows:

1. Sensoria on the third segment very peculiar in shape, being transversely narrow.
2. Body of the wingless form covered with white secretions which are not thready.
3. The oviparous female is winged.

Winged female.—Body rather narrow and without hairs. Frontal tubercles absent. Antennæ nearly as long as body, six-segmented, spur of last segment very small, sensoria on third segment transversely narrow (ring-like in the oviparous female). Ocelli prominent. Abdomen without tubercles. Wings hyaline, the third oblique twice branched. Cornicles very small and much wider than long. Cauda not globular, but is constricted at base and slightly so at middle. Anal plate slightly sinuate. Empodial hairs absent.

Wingless female.—Similar to the winged female. Body with a white pulverulence. Eyes very small. Third antennal segment without sensoria.

Type.—*Neophyllaphis podocarpi*, n. sp.

2. Insects of New Jersey (N. J. St. Mus. Rept. 1909).
3. Coleoptera of Indiana, p. 546.
4. Prelim. List Ins. Prov. Quebec, Coleop. (1917, Suppl. Rept. Quebec Soc. Protec. Plants.)

Neophyllaphis podocarpi, n. sp.

Winged viviparous females.—Body rather narrow and without hairs. Frontal tubercles inconspicuous. Beak slender and reaching beyond the hind coxæ. Eyes large, ocelli prominent. Antennæ slender, without hairs, two basal segments very short, the third nearly as long as the fourth and fifth combined and bearing about 60 small, transversely narrowed sensoria scattered over the entire length, the fourth slightly shorter than the fifth and without sensoria, sensoria at the distal end of the fifth segment small and circular, the sixth as long as the fourth with a small, round sensorium near the apex, spur of last segment very short. Wings not narrow, the third oblique vein twice branched. Abdomen without tubercles. Cornicles very small, much broader than long and broadest at base. Cauda large, rounded at apex, constricted at base and lightly so at middle. Anal plate sinuate. Legs moderately long, slender, and with a few short, fine hairs. Empodial hairs absent.

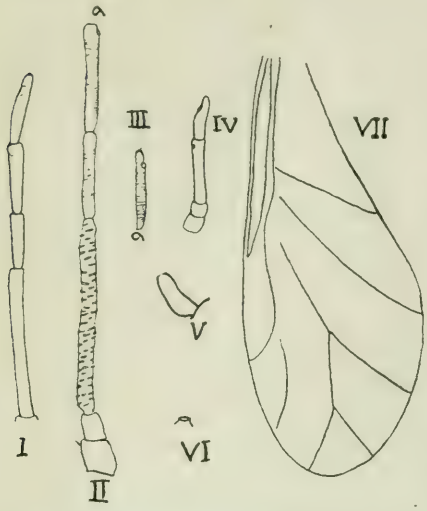

Fig. 6. *Neophyllaphis podocarpi* n. sp. I, antenna of wingless viviparous female; II-III, antenna of winged viviparous female; IV, antenna of immature form; V, lateral view of cauda of viviparous female; VI, cornicle of viviparous female; VII, wing of viviparous female.

Colour dark reddish purple, eyes brownish red, and legs pale brown. Wings hyaline with brown veins.

Length of body 1.3 mm.; of antenna 1.1 mm.; of fore wing 1.7 mm.

Wingless viviparous female.—Body narrow, being broadest at middle, slightly pulverulent, and hairs absent. Frontal tubercles absent. Eyes very small. Beak slender and reaching beyond hind coxæ. Antennæ not reaching to tip of body, slender, and without hairs, third segment longer than the fourth and fifth combined, the fourth shorter than fifth, and the fifth subequal in length to the sixth, spur very short, sensoria absent excepting a single round one near apex of the fifth segment. Body without tubercles. Cornicles, cauda and legs as in the winged female.

Colour dark reddish purple, eyes black, antennæ and legs pale brown, cornicles black and cauda pale black.

Length of body 1.5 mm.; of antennæ 0.9 mm.

Winged male.—Third antennal segment bearing numerous transverse sensoria which are irregularly scattered over the entire segment; fourth, fifth and sixth segments with fewer similar sensoria.

Winged oviparous female.—Third antennal segment with numerous long, encircling transverse sensoria regularly placed; none on remaining segments except the usual distal ones on the fifth and sixth segments. Hind tibia swollen and bearing numbers of sensoria on basal half.

Type Locality.—Meguro, Tokyo, Japan.

As in *Neophyllaphis podocarpi* the oviparous females of *Greenidea kuwanæ* Perg., *Trichosiphum tenuicorpus* Okag., and *Cervaphis quercus* Tak., are winged.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The fifty-sixth annual meeting of the Entomological Society of Ontario was held at Ottawa on November the sixth and seventh. The attendance was good and very representative of the national character of the Society, members being present from Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia. In addition to the Canadian members there were two welcome visitors from the United States: Mr. C. L. Marlatt, Assistant-Chief of the Bureau of Entomology, Washington D. C. and Dr. Summers of Massachussets.

The programme, as the list of subjects given below will show, was not only a full one but covered a wide range of Entomology. Most of the papers were of an economic nature, but several—and these not the least interesting, eschewed the economic aspect altogether and gave instead the results of the observations and studies of the insect lover and naturalist.

The papers which aroused the most discussion were "The Chief Factors in Natural Control" by J. D. Tothill and "My Experience in Dusting and Spraying" by Father Leopold. It was very interesting to observe the difference of opinion as to the importance of such control factors as weather or climate, and scarcity of food supply. There was also a decided difference of opinion as to the best spray mixtures for apple orchards between the Nova Scotia men on the one hand and the Ontario, Quebec and British Columbia men on the other hand. The Nova Scotia Entomologists claimed that under certain weather conditions lime-sulphur applications caused a very noticeable drop of apples which lessened the size and value of their crop; the Entomologists of the other provinces claimed that in their respective provinces there was no evidence of this drop or of any lessening of the crop. Father Leopold's experience was in accordance with the latter view.

The symposium on the Cabbage Maggot was interesting and not only corroborated last year's evidence of the value of corrosive sublimate as a remedy for this pest, but also brought out several new and possibly equally good remedies. The results of further experiments with these next year will therefore be looked forward to with interest.

The popular evening lecture by C. L. Marlatt on "How the United States is preventing the Introduction of Foreign Insect Pests and Plant Diseases" was highly appreciated and felt to be of special value to Canadian Entomologists as was pointed out by the President of the Society when proposing a vote of thanks.

On the evening of the seventh the members and guests were entertained by the Ottawa Naturalists' Club at a smoker in the rooms of the University Club.

The officers for next year are:—President, Mr. Arthur Gibson; Vice-President, Mr. F. J. A. Morris; Secretary-Treasurer, Mr. A. W. Baker; Curator, Mr. G. J. Spencer; Librarian, Dr. C. J. S. Bethune; Editor, Prof. E. M. Walker. The list of papers read was as follows:—

1. Insects of the Season in Ontario—W. A. Ross and L. Caesar.
2. Insect Conditions in the Province of British Columbia—R. C. Treherne.

3. Results of some Preliminary Experiments with Chloropicrin—G. J. Spencer.
4. Ephydra hians and its Occurrence in Western Canada—Dr. C. Gordon Hewitt.
5. Our Common Cercopidae—George A. Moore.
6. Further Notes on the Control of the Pear Psylla—W. A. Ross and W. Robinson.
7. My Experience this year in Dusting and Spraying—Rev. Father Leopoid.
8. The Chief Factors in the Natural Control of Insects—J. D. Tothill.
9. The Present Condition of the Balsam and Spruce Injury in Quebec—J. M. Swaine.
10. Recent Observations on Eastern Ticks.—S. Hadwen.
11. How The United States is Preventing the Introduction of Foreign Insect Pests and Plant Diseases—C. L. Marlatt.
12. Hopkins Bioclimatic Law—W. Lochhead.
13. On the Wings of the Wind—A. F. Winn.
14. Locusts in Manitoba with Special Reference to the Outbreak in 1919—Norman Criddle.
15. Ecological Notes on Certain Species of Locusts prevalent in British Columbia—E. R. Buckell.
16. Symposium on the Cabbage Root Maggot and its Control in 1919. —W. H. Brittain, R. C. Treherne, Arthur Gibson and L. Caesar.
18. Present Status of Pests of Canadian Flour Mills—E. H. Strickland.
17. Life-History of a Hobby Horse—Part II: Boy and Man—F. J. A. Morris.
18. Some Notes on the Life-History of our Common June Beetles—H.F. Hudson.
19. Further Notes on the Life-History and Control of the Strawberry Root Weevil—W. Downes.
20. The Strawberry Weevil—W. A. Ross.
21. Borers in Corn and other Field and Garden Plants which have been or may be mistaken for the European Corn Borer—Arthur Gibson.

L. C.

RECENT CANADIAN PUBLICATIONS.

(Continued from Vol. LI, p. 282.)

Annotated Check-List of the Macrolepidoptera of Alberta.—By Kenneth Bowman. Published by the Alberta Natural History Society. Red Deer, Alberta, 1919.

In this list the author has endeavoured to present in a concise form all the available data on the distribution of the Macrolepidoptera within the Province of Alberta. The work has an attractive appearance, being printed in clear type on a good quality of paper. The generic names, printed in bold-faced type, and followed by the specific names arranged in a column, each name preceded by its number in Barnes and McDunnough's check-list. Two columns follow, giving seasonal and geographical distribution respectively, the former

by numerals indicating months, the latter by abbreviations of locality names, in most cases single capital letters. Two of such treble columns occupy each page, and although a considerable amount of information is thus presented there is no appearance of crowding. Eight hundred and twenty species are listed, and it will be remembered that the "micros" are not included.

A comparison of this list with Winn's Quebec list brings out some interesting facts. The butterflies of Alberta (116 species) outnumber those of Quebec (84 species) by more than one-fourth of their number, while in all the other groups the Quebec list leads. There are more than twice as many Sphingidæ in Quebec than in Alberta (33:15), five times as many Saturnioidea (10:2), and six times as many Sesiidæ (12:2), while the differences in the Arctiidæ (including Lithosiidæ and Nolidæ—37:34), Noctuidæ (488:428) and Geometridæ (193:167) are relatively slight.

Directions for Collecting and Preserving Insects.—By J. H. McDunnough. Circular No. 12, Entomological Branch, Dept. of Agriculture, Ottawa.

This circular gives brief directions for the ordinary methods of collecting and preserving insects and will be found useful, particularly to the novice. A description of the collecting outfit is followed by instructions for collecting the various orders of insects, preserving, mounting and shipping entomological specimens, and for their arrangement in the collection.

From the Agricultural Gazette:—

The Pear Psylla.—By W. A. Ross. Vol. 5, No. 12, Dec., 1918. A brief account of the injuries caused by this pest, its life-history, natural and artificial control. It is illustrated by a plate on which the various stages and work of the insect are shown.

The History of the Codling Moth in British Columbia.—By R. C. Treherne. Vol. 6, No. 1, Jan., 1919.

Since 1905 at least 12, probably 13, distinct outbreaks of the codling moth have occurred in British Columbia at widely separated points, a marked increase in their numbers having taken place since 1912, coincident with a noted rise in the fruit yielding capacity of the orchards of this Province. Vigorous action has been taken by the Provincial authorities to eradicate these outbreaks, the Dominion Entomological Branch acting in an advisory capacity during the past three years. At the close of 1918 codling moths are believed to exist in small numbers in the vicinity of Vernon, Okanagan Landing and Victoria, but have been nearly or quite exterminated from the other localities where outbreaks have occurred.

The operations undertaken wherever outbreaks are reported are described, including the procedure followed in the disposal of fruit in infested areas.

The Rose Midge in Ontario.—By Wm. A. Ross. Vol. 6, No. 2, Feb., 1919. A brief account of this pest, which has been known in Ontario only since 1914. Its life-history, the nature of its injuries, the varieties of roses attacked and methods for its control and prevention are described

The Balsam Injury in Quebec and its Control.—By J. M. Swaine. Vol. 6, No. 3, March, 1919.

This paper describes a serious condition of the Balsam Fir in the Province of Quebec, originating in an outbreak of the Spruce Budworm a few years ago, as a result of which the trees were killed over hundreds of square miles, and those not killed outright have subsequently fallen victims to other insect and fungus enemies. These are the Ground Rot (*Polyporus schweinitzii*), the Sap Rot, the Eastern Balsam Bark-beetle and the Eastern Balsam Weevil. The future of the balsam in the affected regions is not considered to be bright. Suggestions for improving the situation are dealt with under three headings: (1) Utilize the threatened balsam; (2) Burn the slash, and (3) Increase the percentage of spruce in the stand.

The Poplar Borer. — By R. N. Chrystal. Vol. 6, No. 4, April, 1919. This paper is the outcome of observations by the author on a case of serious damage to cottonwood on a ranch near Cowley, Alberta. It contains an historical account of the depredator (*Saperda calcarata*), descriptions of the larva and adult, and of their life-history and work. Remedial measures are suggested for dealing with outbreaks of the beetle on a large scale and for treating individual trees.

The Greenhouse Leaf-tyer (*Phlyctænia ferrugalis* Hbn.).—By Arthur Gibson. Vol. 6, No. 7, July, 1919. This is another European insect, known in Canada since 1899, and now widely distributed in the East. The caterpillars attack a wide range of greenhouse plants, particularly soft-leaved species. The life-history, injuries, enemies and methods of control are described.

An Infestation of Apple Sucker, Psyllia malis, Schmidb., in Nova Scotia—.By W. H. Brittain. Vol 6, No. 7, 1919.

This is a new and very undesirable immigrant from Europe, which appeared in a severe outbreak at Wolfville, N.S. Full descriptions and figures of the adult and fifth nymphal instar are given. The injury is similar to that of the Pear Psylla, the really serious damage being caused by the nymphs only. At the season of its discovery the outbreak was too advanced to permit of saving the crop, but preliminary tests with a liquid spray (nicotine sulphate, one pint to 100 gallons of water, applied as a heavy drenching spray by means of a "Friend" gun) gave excellent results. Other tests were made with various contact dusts, but were less effective.

From the Ottawa Naturalist:—

The Genus Vespa in Canada. Key to the species. By F. W. L. Sladen. Vol. XXXII, No. 4, Oct. 1918, pp. 71-72. Four new species are accorded, *V. norvegicoides, albida, acadica* and *atropilosa*

Insect Galls and Gall Insects. By E. P. Felt, Albany, N.Y. Vol. XXXII. No. 7, Jan., 1919, pp. 127-131. A popular account of this subject, describing some of the structural and adaptive features of insect galls, the relations between gall insects and their plant hosts, the alternation of generations in the Cynipids and gall aphids, the apparent mimicry of some galls, occurrence of inquilines, etc. It is illustrated by two plates, showing characteristic forms of insect galls. E.M.W.

(To be continued.)

Mailed January 27th, 1920

The Canadian Entomologist

VOL. LII. LONDON, FEBRUARY, 1920. No. 2

POPULAR AND PRACTICAL ENTOMOLOGY.

A DAY'S BEATING.

BY C. A. FROST,

Framingham, Mass.

The rosy dawn of this early June morning has been followed by dull gray clouds which, slowly massing across the sky, presage rain for the afternoon. A good day for the beating umbrella both for catching beetles and for shelter on the way home.

My preparations for a day in the woods are generally made the evening before, or I am sure to forget something in the hurried morning start. A large, wide-mouthed bottle for the bulk of the catch and several small vials for the minute things or paired specimens that should be kept separate, filled with alcohol (denatured is just as good for the purpose), are deposited in pockets convenient for instant use. A small cyanide bottle for specimens whose colour will not stand alcohol, and a large cyanide jar for Lepidoptera or other insects interesting to brother collectors, are placed in side pockets or in the corduroy bag that is slung over my shoulder. This bag contains: a large knife, a trowel, a drinking cup, a fine wire strainer of five inches diameter for dipping up water beetles, an old pair of gloves to protect the fingers when much collecting is done under stones, two or three tin boxes to which I transfer Lepidoptera and Hymenoptera as soon as they are dead (to prevent rubbing), a white cloth with loops at each corner to hold two diagonally crossed sticks which will keep the cloth spread so that it can be used in place of the umbrella if that instrument collapses (as often happens) at the most interesting point of the capture. I also have a net that fits into the bag, made of brass wire leaded into a brass union, which in turn is screwed into a brass increaser; into the larger end of this a stick can be screwed and fastened by a tack through a hole drilled in the rim of the increaser. Nets of several sizes or kinds can be carried along, and at once interchanged by merely screwing them into the increaser. Last but not least I make sure that my forceps are in the sheath that is pinned on the inside of my coat at the most convenient height for hurried seizing.

Thus equipped I hasten down the side streets to the railroad tracks that lead to Sherborn town. Half a mile brings me to an interesting swamp beside the track and, although within a stone's throw of a busy foundry, I am seldom able to get past it without investigating its possibilities. In this swamp all the wood has now been cut off but a few old willows, and the dead and dying bushes and young trees often yield some very good things. It is here that I take *Pogonocherus salicicola* Casey, and the species was determined for me by its describer from specimens that emerged from dead twigs collected from these willows.

Splashing through the ankle-deep brown water I cannot resist an attempt

to get something from the bunches of live willow sprouts that have escaped the grass fires. The attempt always brings a multitude of *Crepidodera helxines* L., or a shower of brown-tail moth caterpillars into the umbrella, and to-day is not the exception. I have occasionally found a few *Rhynchites cyanellus* Lec. among the usual vermin.

My beating stick is any handy dead limb of suitable length, and it can easily be replaced. The blows on the scraggly old dead willows shower down bits of bark and moss with an occasional *Allandrus bifasciatus* Lec., *Acoptus suturalis* Lec., or *Chramesus icoriæ* Lec. From the smaller trees I get a score of *Laemophlaeus adustus* Lec. and *convexulus* Lec., an occasional *biguttatus* Say or *fasciatus* Mel., *Psenocerus supernotatus* Say, *Orchesia castanea* Melsh., and still more rarely *Pogonocherus salicicola*, *Leptorges querci* Fitch and *facetus* Say. Across the track the alders and fire-killed bushes yield numbers of *Laemophlaeus* and *Molamba* which are barely discernible as minute dots crawling on the dark umbrella. Some of the Cerambycids remain perfectly still on the cloth, and are occasionally picked from the very edge where the least motion would tumble them to safety.

New fields lure me on down the track half a mile more to the woods and meadows, but I must always stop to take a whack at the clump of poison sumac growing by the fence on the edge of the swamp that stretches away to the brook beyond the higher ground. It yields as usual only *Psenocerus supernotatus*, and the chokecherry and red maple are even less productive, although I have taken some good things from the sprouts of the latter, notably *Purpuricenus humeralis* Fab., *Limonius aurifer* Lec. (in Maine), and *Corymbites nigricornis* Panz. (typical *nitidulus* Lec.) once in numbers.

Near the track fire has killed all the large trees of the high ground, and it has grown up with bunches of blueberry, amelanchier and sweet fern. The former yields nothing at all generally, but the amelanchier I have now visited at the most favourable time, and when I have finished with them I have several specimens of the rare *Agrilus vittaticollis* Rand. and a set of *Saperda candida* Fab. The latter I have never taken otherwise, except once only, when I suddenly saw one balanced on the tip of a dead sprout almost between my legs.

Travelling east again down a wood-road, I visit a few white pines that have escaped the fires. The lower branches of these I am able to reach with a long limb, and almost the first blow brings down a beautiful green beetle, *Chrysobothris harrisi* Hentz, a very welcome find. I attack the trees with renewed vigour when a sharp sting in the vicinity of my collar bone causes me to suspend operations with visions of a ferocious, white-faced hornet probing about my jugular vein. Hastily throwing off my coat and bag I frantically try to dislodge the intruder by tearing open my shirt and getting head down over the umbrella, for entomological curiosity compels me to search out the identity of the insect that has violated the sanctity of my person. At intervals during these manœuvres, when the clothing binds the insect, it deliberately, but with unexpected moderation, punctures my skin, selecting five different places before it is released and falls to the umbrella; it is a yellow hymenopter whose identity is unknown to me. After arraigning the intruder in appropriate, if not ethical, language the search for *C. harrisi* is continued with one more specimen as a reward. In Maine *Corymbites medianus* Germ., and *propola*

Lec., and *Harmonia picta* Rand. are common fruit of the white pine, but not here. I have taken *Rhinomacer elongatus* Lec. in numbers and *Dinoderus substriatus* Payk. sparingly by beating cut pine tops when the needles were dead enough to fall.

From these trees I wander through the red maple saplings, speckled alder and blueberry bushes to the edge of the meadow with its gently-waving grasses and tangled cranberry vines. I recline at ease on the soft grass on the bank of a slowly flowing brook, and watch the crows silently flying to and from their nests that I know are hidden in the woods beyond. *Dineutes* and *Gyrinus* are whirling and spinning on the water at my feet. The tiger beetles, *C. repanda* Dej., are hunting on the patches of white sand of the further bank. To the right is a grove of waving pines, the green of their needles contrasting pleasingly with the darkness of their trunks; in front of me are tall chestnuts and oaks; to the left of the green meadow is traversed by the brook that disappears in a sudden bend behind the oaks and chestnuts. Many happy hours have I spent beside this brook, and again I recall the day I swept *Leptura deleta* Lec. from the Spiræa blossoms almost within the shade of the murmuring pines; the time I almost got *Leptura subhamata* Rand. on the same flower, and the plant which bore it is now within my sight. How I pawed around in the dead grass on hands and knees on the soggy meadow bottom for a full hour after the elusive specimen, and with what regrets I finally gave up the quest. And so each spot recalls some entomological event that is again enacted as I dream beside the winding stream. A spotted turtle goes pawing his course down along the bottom of the brook and reminds me that I must be on the move, for it is nearing noon, and although the rain still holds off it will not spare me much longer.

I must try the grove of young pines half a mile further on for I have found that pines and other evergreens along the edges of a wood are the hiding places of many beetles in cloudy weather, and even in sunny weather after 4 p.m. or before 10 a.m. I have also had wonderful luck sweeping *Alnus incana* bushes in Maine at sunset, taking many rare things in numbers, such as *Elater sanguinipennis* Say, and *semicinctus* Rand., *Cardiophorus convexulus* Lec., *Melanotus leonardi* Lec., *Corymbites hamatus* Say, *Lyctus striatus* Melsh., and *opaculus* Lec., *Saperda obliqua* Say, and *lateralis* Fab., *Oberea pallida* Casey, *Agrilus pensus* Horn and many other lesser lights. By beating Alnus sprouts when the sun was shining in the afternoon I once took many *Dicerca caudata* Lec., *Eupristocerus cogitans* Web., and *Oberea pallida* in Maine. In Massachusetts I have had no such good luck with Alnus, and can only record *Anomala lucicola* Fab. *Harmonia similis* Rand. and *Adalia frigida* Schn., all of which are rather uncommon in this locality.

Down the brook, ignoring the fine sweeping grounds on either side, I hasten on towards the rocky hill fringed with scattered pitch pines and topped with small oaks, hickories and well-browsed hazel bushes. On the south slope is an open grove of young white pines that should well repay a visit. The first tree gives me a regular shower of *Dichelonycha albicollis* Burm. and *Glyptoscelis pubescens* Fab., both of which are well-known products. A thorough canvass of the trees yields nothing else, but a barberry bush in flower drops an *Elater collaris* Say into my umbrella to lighten the disappointment.

I try the hickories, which on sunny days may have some *Anthaxia quercata* Fab. (and later, in July, *Diccrca lurida* Fab.), *Saperda lateralis* Fab. or *Tymnes tricolor* Fab., but nothing appears except *Sinoxylon bidentatum* Horn from the dead twigs. The hazel bushes are also non-productive to-day except for *Chlamys plicata* Fab., which can be swept by dozens from sweet fern at times, and a few *Atteladus rhois* Boh. If the sun were shining I should expect *Agrilus ctiosus* Say in numbers, *arcuatus* Say (variety *coryli*) and *politus* Say, which so resemble each other in colour as to be indistinguishable without a lens, *Calligrapha rhoda* Knab, and possibly a few *Agrilus defectus* Lec. and *cephalicus* Lec.

The pitch pine (*Pinus rigida*) gives up a few *Melanotus*, one *Corymbites triundulatus* Rand. and one *Harmonia picta* Rand., which are both rare here. At sunset I have had fine success with a few of these trees at the top of a small hill, taking *Chrysobothris floricola* Gory, *Enoclerus nigrifrons* Say, *Ernobius luteipennis* Lec., *Pogonocherus mixtus* Hald., *Eupogonius tomentosus* Hald., *Corymbites splendens* Ziegl., and *propola* Lec. At another time I found the twigs swarming with *Anomala oblivia* Horn.

The scattered cedars (savins) of the pasture here have never yet paid me for the time spent on them, and I might say the same of live elm (unless one is looking for the elm leaf-beetle), ash, apple, chestnut and, in Maine, the spruce and fir, although I see no reason why the two latter should not make as good hiding places as the pines and hemlocks. It is very probable that the time and place entirely govern success in beating, and while I always give them a stroke or two, elm, apple and cedar are absolutely hopeless to me. The oaks are the most prolific as a whole, but must be visited on sunny days, preferably along towards 5 p.m., as the insects are then less active and can be secured without the losses that are sure to occur by quick flight during the heat of the early afternoon. Among the more interesting things from oaks are: *Chrysobothris azurea* Lec. (dead white oak), *Agrilus masculinus* Horn, *acutipennis* Mann., *auricomus* Frost (red oak), *crinicornis* Horn (raspberry leaves in Maine), *Elytroleptus floridanus* Lec., *Bassareus mammifer* Newm., *Rhynchites aeneus* Boh., *Auletes ater* Lec., *Pterocolus ovatus* Fab., and several species of *Balaninus*.

The rain is now gently falling in fine scattered drops as I stop by the brook to try the young poplars and alders growing thick over a small area near the railroad. The former gives me one *Cotalpa lanigera* Linn., and plenty of *Phyllodecta vitellinæ* Linn. At other times I have taken an occasional *Agrilus anxius* Gory, and *Saperda concolor* Lec. with *Zeugophora puberula* Cr. turning up in large numbers twice from poplar. From the alders I now get a single *Dicerca pugionata* Germ., which rounds out a perfect day as I have now taken my second specimen of this fine species. *D. caudata* Lec. is rarely seen resting on the side of the stems of the young alders, from whence it may, sometimes, be knocked into the net or umbrella.

Back along the brook I hasten while the rain increases in intensity with every intermittent shower. I tarry a few moments in the heavy growth of oaks and chestnuts through which the rain has not yet penetrated. Here I bring down *Melanotus castanipes* Payk., two species *of* Platydema, *Phloetrya litzurata* Lec., and *Agriotes oblongicollis* Melsh. in numbers by vigorous kicks against the dead saplings. I once brought down a shower of *Bostrychus armiger* Lec. from a dead white oak sapling by this method; it was in a thick wood

and none of the other oaks near by gave me a single specimen, and I have never happened on them again. In Maine I have beaten the rare *Enchodes sericea* Hald., *Microbregma emarginatum* Duft., *Oligomerus obtusus* Lec. and *Elater apicatus* Say from the dead lower limbs of large sugar maples.

A final kick at a dead stub brings down the whole top smashing into the umbrella with disastrous results and, casting away the now utterly useless implement, I plod along in the pouring rain over the railroad ties towards home. When I arrive there I am soaking wet but happy in the memories of the day's experiences, and each time I open my boxes these memories will be reflected from the shining armor of *Dicerca pugionata* and *Chrysobothris harrisi*.

NOTES ON COCCIDÆ. V. (HEMIPTERA).

BY G. F. FERRIS,
Stanford University, California.

(Continued from Can. Ent., Vol. 51, p 253.)

Genus PROTODIASPIS Ckll.

The original description of this genus was not sufficiently detailed, and much doubt has existed as to its exact nature. Through the kindness of Professor Cockerell I have been enabled to examine a slide mount of *P. parvula* Ckll., the type of the genus, and find it possible to extend somewhat our knowledge of this and related species.

The original description of the genus was as follows: "A genus of Diaspinæ secreting no scale but the females enveloped in cottony secretion, the male pupæ resembling those of Diaspis, but extremely short. No grouped circumgenital glands." To this genus there have previously been referred, (with some doubt) *Protodiaspis anomala* Green, *P. tridentata* Ferris, *P. edentula* Ferris, *P. agrifoliæ* Essig and *Fiorinia syncaripæ* Maskell. Of these only *P. agrifoliæ* Essig can be considered as congeneric with the type, and I am here naming a new genus for the others.

I am unable at present to offer any very precise definition of the genus *Protodiaspis*, partly because of certain possible errors in the original description that I am not able to clear up, partially because of the need of more information concerning the immature stages and partially because of the hazy limits of certain other genera. I present, however, the following characterization, this being based upon *P. parvula*, *P. agrifoliæ* and two other species that I am here describing as new.

Coccidæ referable to the subfamily Diaspinæ, secreting a distinct scale or possibly in some cases merely loose secretion; the scale of the female circular with the exuviæ central, that of the male elongate with the exuvia at one end, in both sexes white; second exuvia of female large but not at all, or at the most only partially, enclosing the adult; tubular ducts (Fig. 1B) of the type seen in *Diaspis* and related genera, all small, those of the pygidium scattered; pygidium usually weakly or not at all chitinized; circumgenital pores present or absent; lobes of the pygidium present or absent. Small species (about .5 mm. long) as far as known infesting only oaks.

Protodiaspis parvula Ckll.

1898.—*Protodiaspis parvula* Ckll., Ann. Mag. Nat. Hist., (7), 1:428.

Material Examined.—Slide mount from the type material, from oak, Mexico.

Notes.—The material examined is not in sufficiently good condition to permit the making of figures or of adding much to the original description. I may note, however, that the insect is apparently very similar to *P. agrifoliæ* Essig, differing chiefly in the absence of circumgenital pores. The dorsum of the pygidium possesses numerous small ducts, as in the latter species. I am unable to detect any lobes. The species is so very similar to *agrifoliæ* that I cannot regard the two as anything but congeneric. As *P. agrifoliæ* has a distinct scale, it appears quite possible that the original description of *parvula* is in error in the statement that this species has no distinct scale.

Protodiaspis agrifoliæ Essig.

Fig. 7.

1914.—*Protodiaspis agrifoliæ* Essig, Journal Ent. and Zool., 6:75–80, figs.

Habit.—Scale of the female white, circular, quite high convex; male, according to the original description, "The exuviæ of the males are yellow, and their position is somewhat distinct from the posterior end. The scales are little more than fluffy, snow-white cocoons, made of fine white cottony material. . ."

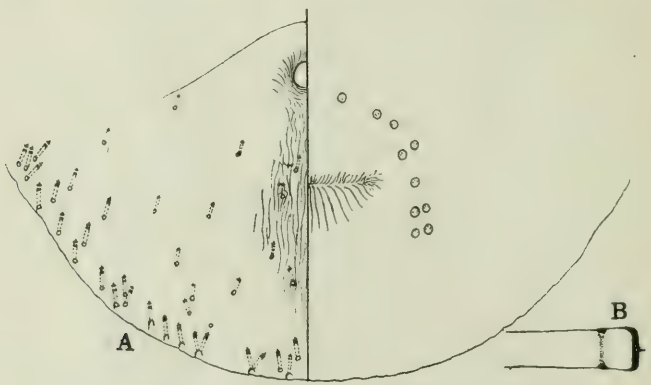

Fig. 7.—*Protodiaspis agrifoliae* Essig. A, pygidium; B, type of duct.

Adult Female.—Length .5 mm., form oval. Derm everywhere membranous except for the anal ring, and a faintly chitinized area immediately about and caudal of the anal orifice. Dorsum of the pygidum (Fig. 1A) with numerous small tubular ducts, and the margin of the body with a continuous narrow zone of such ducts. Circumgenital pores present, arranged in an almost continuous arch of 20–30 pores. There appear to be no gland spines at any point on the body.

Second Stage.—Figured by Essig as possessing small lobes, but in a mount of the exuvia at hand it appears not to differ from the adult.

Notes.—Structurally this appears to be so close to *P. parvula* that there can be but little doubt that the two are strictly congeneric, in spite of the statement that the former species possesses no definite scale.

Protodiaspis lobata, n. sp.

Fig. 8.

Type, Host and Locality.—Taken from an herbarium specimen of *Quercus gambelii*, from four miles east of Santa Fè, New Mexico.

Habit.—Scale of the female as in *P. agrifoliæ*, that of the male elongate, slender, white and non-carinate.

Adult Female.—Length .4 mm., form broadly oval. Derm everywhere membranous, except for a very small area immediately about the anal ring, one or two irregular, very small areas on the dorsum of the pygidium and the lobes. Dorsum of the pygidium with numerous scattered ducts and the margin of the body likewise with a continuous zone of such ducts. Margin of the body also with a practically continuous row of small gland spines. Pygidium with two pairs of small, irregularly-shaped lobes and with two or three pairs of small gland spines. Circumgenital pores lacking.

Fig. 8.—*Protodiaspis lobata*, n.sp. Pygidium.

Protodiaspis pulchra, n. sp.

Figs. 9, 10 and 11.

Type Host and Locality.—From herbarium specimen of *Quercus toumeyi*, from Pedestal Rock, Chiricahua Mts., Ariz.

Habit.—Scale of the female as in *P. agrifoliæ;* scale of the male not seen.

Adult Female — Length .5 mm.; form slightly elongate oval or somewhat irregular (Fig. 9A); cephalothorax and pygidium tending to be quite heavily chitinized. Pygidium (Fig. 10) somewhat acuminate, the tip narrowly rounded. Two pairs of lobes present, the inner pair quite close together and widely separated from the outer pair. Outer lobes composed of two lobules, of which the outer is the smaller. Dorsum of the pygidium with numerous scattered and very small ducts. Anal opening closer to the anterior margin of the pygidium than to the posterior, and slightly cephalad of the vaginal opening. Margin of the body with a continuous zone of small ducts, but without gland spines.

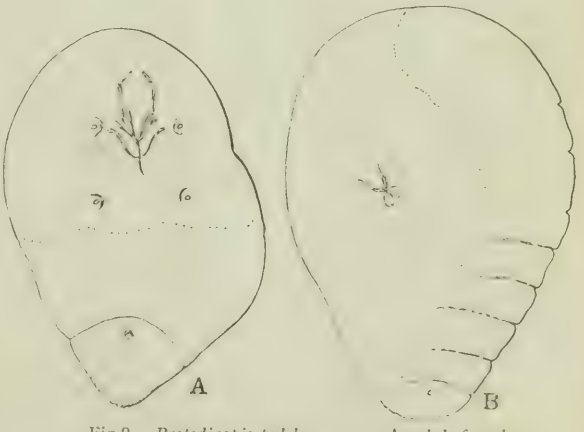

Fig 9.—*Protodiaspis pulchra*, n.sp. A, adult female; B, exuvia of second stage.

Second Stage.—Only exuviæ are available for examination. In these one side is much more heavily chitinized than the other (Fig. 9B). The pygidium (Fig. 11) is short, broad and almost truncate. There are apparently two pairs of very small lobes and the dorsum bears a few very small ducts.

Notes.—This differs rather widely from the other species

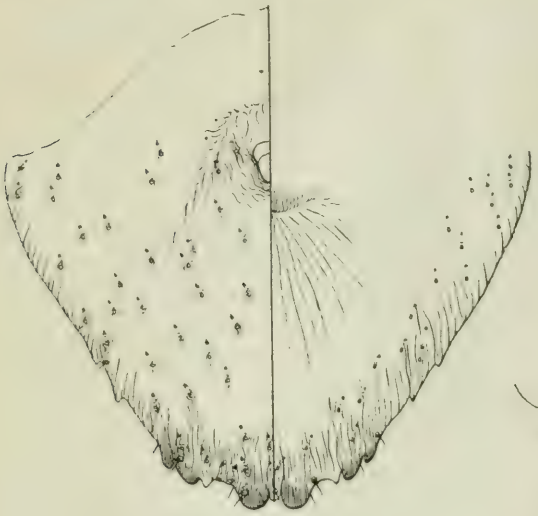

Fig. 10.—*Protodiaspis lobata*, n.sp. Pygidium of adult female.

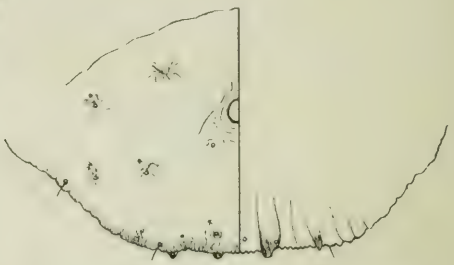

Fig. 11.—*Protodiaspis pulchra*, n.sp. Pygidium of second stage from exuvia.

of the genus, so much so as to complicate the definition of the group, but it may be referred here for the present, at least.

Genus Ancepaspis, new genus.

Coccidæ referable to the subfamily Diaspinæ but in which neither the male nor the female secretes a scale, the adult of both sexes being included within the derm of the preceding stage which becomes heavily chitinized; exuvia of second stage of female dehiscing about the posterior margin to permit the escape of the larvæ; adult female without circumgenital pores, and all stages without tubular ducts either on the pygidium or elsewhere; pygidium of the adult female with the margin more complex than that of the second stage, or at least not less complex. Small species (adult less than 1 mm. long) occurring on hosts of the families *Fabaceæ*, *Mimosaceæ* and *Cassiaceæ*.

Type of the genus, *Protodiaspis tridentata* Ferris[1].

Notes.—In addition to the type, the following may definitely be referred to this genus; *Protodiaspis anomala* Green, *P. edentata* Green and an undescribed species which I shall discuss in another paper. Green has suggested that *Fiorinia syncarpiæ* Maskell and *F. secreta* Green are congeneric with this group, but in both of these species the male is described as having a secretionary scale. I have seen the male of an *Ancepaspis* only in connection with the undescribed species mentioned above, but this species is so clearly congeneric with at least *tridentata* and *edentata* that there can be no question as to the relationship of these forms.

This is a most peculiar group, having but little resemblance to the ordinary Diaspine types. It is probably not related to such genera as *Fiorinia* and *Leucaspis*, in which tubular ducts are present at least in the nymph.

1. *Protodiaspis tridentata* Ferris, Contrib. Knowl. Coccidæ Sw. U. S., p. 46, fig. 22. *In* Stanford University Publications, University Series, 1919.

THE GENERIC POSITION OF SPHINX SEPARATUS NEUM.

BY T. D. A. COCKERELL,
Boulder, Colorado.

On Aug. 23, 1918, a strange sphingid larva was found in a tomato patch at 905 Lincoln Avenue, Boulder, Colorado. It was about 110 mm. long, with a diameter of 16 mm.; head black, with a dark red stripe on each side; general colour of body creamy-white, with black and dilute black markings, the under side plumbeous. The caudal horn was small and black. The most conspicuous markings were on the dorsum of thorax, and were large and intense black; consisting of a trilobed or trefoil-like mark behind the head, with a short stem to the anterior margin of the segment, and a much larger broad, elongate mark on the hinder part of thorax, the interval between these markings having a pink suffusion. The thorax also had three round black spots on each side. Beyond the thorax, the dorsum was ornamented by transverse rows of small spots,and laterally by short, oblique, black marks, directed dorso-cephalad, i. e., in an opposite direction from that of the lateral stripes of *Sphinx*. From the caudal horn, however, a short, black band passed anteriorly on each side, homologous with a similarly placed marking in *Sphinx*. In the middle of the body, also, the oblique stripes of *Sphinx* were more or less distinctly developed, as rather short, dark bars, dorsally. A more or less distinct +-shaped mark was behind the larger thoracic patch, and a similar one anterior to the caudal horn.

This peculiar larva, very unlike that of *Sphinx*, produced a pupa in which the maxillary loop is about 22.5 mm. long, not allowing for the curvature, and strongly arched from the surface of the body (distant from it at one point as much as 5 mm.), with the end bulbous. The metathoracic ridge, about 6.5 mm. long, is only very narrowly interrupted in middle, the interval less than half a mm. Dorsally, the abdominal segments are strongly punctate anteriorly. The spiracular furrows are deep and about 4 mm. long, not extending ventrad of the spiracle; excepting, however, the posterior furrow of the first pair, which is longer, and goes ventrad of the spiracle by a distance almost equal to the length of the latter. Pupa is about 53 mm. long; colour dark chestnut red.

Judging from the pupa, and following the characters so admirably presented by Dr. Edna Mosher, this insect should have been a *Protoparce*. The moth, however, is *Sphinx separatus* Neum.! This species does not seem to me to be a true or typical *Sphinx*. The antennæ are curved at the end, approaching the condition of *Protoparce*, and the markings of thorax and anterior wings are very *Protoparce*-like. The black and white lateral banding of the abdomen, and the heavy (coalesced) bands on the hind wings are striking specific characters. On the under side the resemblance to *Protoparce sexta* is quite close. The eyes, in *Sphinx*-fashion, have very long lashes, but *P. sexta* has evident though much shorter ones. Mr. B. Preston Clark, working with the adult insects, kindly tells me that he cannot find adequate grounds for subdividing *Sphinx*, of which he has before him all the known species but two. Nevertheless, in view of the peculiar larva, and especially the characters of the pupa, far more striking than those used to separate the moths of the two genera in question, it seems necessary to regard *S. separatus* as the type of a distinct subgenus or possibly genus. For this I will propose the name *Mesosphinx*.

We have found two species of more typical *Sphinx* at Boulder; *S. drupiferarum* Abb.-Sm., collected by William Winner, and *S. vancouverensis* Hy. Edw., collected by Rosamond Patton.

A PARASITE OF DERMESTID BEETLES IN ENTOMOLOGICAL COLLECTIONS.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO, BOULDER.

In the fall of 1914 a specimen of *Libellula pulchella* was caught at Forest Hills, Mass., and came into the possession of Mr. J. T. Scott, then a student at the Bussey Institution. It was placed in a box which was taken to Lynchburg, Virginia, and there remained 2½ years. For at least a year past it was known that the specimens were infested by anthrenids. About Sept. 5, 1918, the box was received by Mr. Scott at Boulder, Colorado; and on Sept. 15 several small hymenopterous insects were found alive in it. On investigation, Mr. Scott found small, pure white cocoons on the *Libellula*, two upon the wings and two inside the thorax. Anthrenid larvæ were also found, showing evidence of parasitism. There was one Anthrenid larva still alive.

On examination, it was easily determined that the insects were Bethylids of the genus *Lælius* Ashmead. This genus is well known to be parasitic on Dermestid larvæ, and consists of the following species, as far as yet known:

1. U. S. species. *L. trogodematis* Ashm., *L. tricarinatus* Ashm., *L. rufipes* Ashm., *L. nigripilosus* Ashm., *L. fumipennis* Brues.
2. French species, *L. bipartitus* Kieff., *L. tibialis* Kieff., *L. perrisi* Kieff.
3. Italian species, *L. fulvipes* Kieff., *L. anthrenivorus* Trani.

Mr. Scott's insect, which undoubtedly attacked the anthrenids in Virginia, is easily separated from all those of America by the clouded wings and dark legs with red anterior tibiæ. It may be described as follows:

Laelius utilis, n. sp.

Female.—Length fully 3 mm., anterior wing 1,850 microns; black, highly polished, the surface of head and thorax microscopically tessellate, the front with very sparse but large piliferous punctures; wings clouded beyond the middle; nervures dilute fuscous; legs superficially appearing black with bright ferruginous anterior tibiæ, but the other tibiæ and all the tarsi are obscure dark reddish; the legs have sparse, long, black bristles, the tarsi with short, black hair. The abruptly truncate metathorax has the dorsal surface very beautifully ornamented, with fine longitudinal plicæ, three in the median region, and one near each side; there are also shorter plicæ between these, arising from the base; between the median and subdorsal plicæ the surface is minutely cancellate, and beyond the subdorsal plicæ it is very finely transversely striate; the plicæ, except the median one, border a series of large, shallow pits. The apical truncation of metathorax is minutely cancellate, with a delicate median raised line. Mandibles, base of antennæ and trochanters reddish, but palpi dark. Third and fourth abdominal segments minutely transversely lineolate on basal half.

The type will be placed in U. S. National Museum.

NOTES ON SOME SYRPHIDÆ (DIPTERA) COLLECTED IN ENGLAND AND FRANCE DURING 1917–18.

C. HOWARD CURRAN,
Vineland Sta., Ont.

While on military service in Europe a few opportunities for the collection of insects occurred. Such opportunities were not anticipated, and as a result, all the insects taken were captured in the hand, a not very satisfactory, and certainly a very disappointing method in so far as the collector is concerned. However, some thirty-six species of Syrphidæ have been determined, and it is interesting to note that several of these are considered by Verrall (British Flies, Vol. VIII) to be rather scarce in England.

Unfortunately the specimens collected in France, with the exception of a very few, were lost, due to unforeseen circumstances. They were packed away in cotton wool in a tobacco tin, and when my kit arrived from France it was found that all tobacco, including all tins, had been confiscated by my brother officers. Evidently some smoker received a huge surprise.

Naturally, conditions in Europe and America are vastly different as regards collecting. Kent and Sussex, England, I found to be ideal collecting grounds, and many "perfect" localities were found. About twenty acres of flowering shrubs and flowers, dotted with ponds and surrounded by woods, at Horsham, Sussex, furnished most of the specimens collected. At Cuckfield, (near Hayward's Heath), a slashing, with young willows in bloom, was to be found in Diptera. At Hythe, an open woods (out of bounds), in which many flowers were growing proved to be a good place for Syrphids. Less favourable localities were found in other parts of England and Ireland; no collecting was done in Scotland, although observations were made.

In France all the collecting was done about a mile from the coast, near Estaples, in an old shrubbery and a strip of wood adjoining a marsh. Many flies, especially belonging to the Syrphini, were observed on the edges of the trenches, even where gas was used freely. *Syrphus balteatus* was one of these.

General observations seemed to indicate a larger number of common species and a greater abundance of insect life in general.

Two of the genera collected do not occur in North America, and both are very interesting connecting forms. These are marked with a†. Those marked with an asterisk occur in Canada.

Microdon sp. I note a single specimen taken at Le Touquette, France, in June, 1918, because the specimens belonging to the genus are not at all common. It was taken on currant leaves in a narrow strip of woods.

Pipizella virens Fabr. Two females, Horsham, Sussex, early June, on leaves of low-growing plants.

Chilosia illlustrata Harris. A single male taken at Cuckfield, Sussex, late May, in a slashing with young willows growing. The flies were fairly common, sunning on dried leaves on the ground.

Chilosia albipila Meig. Four specimens taken in the same place as the preceding, and also on willow blossoms

**Chilosia variabilis* Panzer. Two females taken at Horsham, Sussex, early June, 1918, sunning on leaves.

Chilosia pulchripes Loew. Male, Hythe, Kent, Aug., 1917, on flowers in wood.

Chilosa vernalis Fallen. Male, Cuckfield, April, 1918, willow slashing.

Melanostoma melinum Linn. Two females from Horsham, early June, 1918, sunning on leaves.

Melanostoma scalare Fabr. Three females, two from Horsham, early June, 1918, one Hythe, Aug., 1917.

**Platychirus peltatus* Meigen. Male and female, Horsham, early June, sunning on leaves.

Platychirus albimanus Fabr. Male, Hythe, Aug., 1917; female, Horsham, June, 1918, male; Cuckfield, April, 1918; the first on flowers, the last two on leaves.

Platychirus manicatus Meigen. Female, Horsham, early June, 1918, sunning on leaves.

†*Xanthandrus comtus* Harris. Male, Hythe, on bloom in open woods, Aug., 1917. This genus is not represented in North America, and the species, which is not common, is its only representative. It is related to *Syrphus* and *Melanostoma*.

**Scaeva pyrastri* Linn. Male, Hythe, Kent, Aug., 1917, on bloom in open woods.

**Syrphus ribesii* Linn. Female, Horsham, June; male, Kilkenny, Ireland, Oct., 1918. This species is not nearly so common as in America.

**Syrphus cinctellus* Zett. Male and female, Horsham, early June, 1918. Possibly occurs in N. America, but not very common in England. Specimens taken in flower garden, on bloom.

Syrphus luniger Meigen. Female, Horsham, June, 1918, on bloom in garden. Belongs to the *arcuata* group.

Syrphus balteatus DeGeer. Seven males and females from Hythe, Kent, in open woods. I also observed specimens in various other places, in England, Ireland, Scotland and France. It appeared to be the most common species of the genus, and was especially abundant near streams and damp places, as well as on bloom.

Sphaerophoria menthastri var. *picta* Linn. Horsham, a single female, taken on bloom in early June. I have also a specimen taken from the class collection at the Ontario Agricultural College, 1913. I doubt if the specimen was taken in Canada.

Sphaerophoria scripta Linn. Two males and a female, from Mr. J. E. Collin, London. Unforunately a large series of this species was not obtained. From a comparison with *S. cylindrica*, I do not think that it is the same species.

Ascia podagrica Fabr. Male and female from Newmarket, Eng., April 4, 1918, taken on leaves of ground plants, sunning. A very small species, and extremely difficult to catch without a net.

Baccha elongata Fabr. A single male, Kilkenny, Ireland, Oct., 1918. I observed this species also at Horsham and found it to be very numerous in France, in rather long grass on the edge of a marsh. I took twelve specimens in half an hour.

Rhingia campestris Meigen. Six males and females, Horsham, early June,

on bloom in deep woods. The species is much like *R. nasica*, Say, but more reddish, and the thorax is darker in both sexes.

Volucella inflata Fabr. Female Horsham, Sussex, early June, in flower garden Fairly common. I also had specimens from France.

**Volucella bombylans* Linn. Var. *bombylans*, male, and female Horsham, early June, and specimens taken in France. Var. *plumata* six males and females Sussex. This species is very common, especially the latter variety, which corresponds exactly to our *V. facialis* Will Our *V. evecta* should be considered a variety of *V. bombylans*.

**Eristalis tenax* Linn A female from Hythe and a male from Kilkenny. I found the species to be common everywhere.

Eristalis pertinax Linn. Eight males and females from Hythe and Sussex. The species is common on bloom and sunning on leaves. It resembles *E. tenax*, but is more slender and more pilose.

**Eristalis nemorum* Linn. Two males Horsham, Sussex, early June. This species, which has recently been recorded from the Maritime Provinces, is common in England. Specimens were taken sunning on leaves, and observed about the edge of a pond.

**Eristalis arbustorum* Linn. A single male from Horsham, early June, 1918. This species is very common in Canada. Williston describes it as *E. brousii*, and it is confused with *E. meigenii*. In England and France I found it to be quite common, but neglected to take specimens.

Helophilus pendulus Linn. Two females from Horsham, early June, on leaves and bloom, and a third specimen, evidently different, from Ireland. I took a large number of specimens of this genus in France, evidently belonging to two or three species.

**Merodon equestris* Fabr. Ten males and females beonging to four varieties: *equestris*, *narcissi*, *vallidus*, and *transversalis*. This injurious species was very common in Sussex, about bloom in gardens. The larvæ bore into healthy bulbs. I recently examined an importation of narcissi, 10% of which were infested.

Criorhina berberina Fabr. Female, Cuckfield, late May, 1918, in willow slashing. It is much like *C. tricolor* of the West Coast, in colour, but structurally different. It is not common.

Criorhina ranunculi Panz. Female, from willow bloom, late May, 1918, Cuckfield. "The most handsome British Syrphid" Verrall. Not at all common; a large, long, black, pilose species, with lighter pile on the scutellum and end of the abdomen.

**Xylota segnis* Linn. Four males and females from Hythe and Horsham. A common species. I observed it on hawthorn and other bloom in various parts of England.

**Syritta pipiens* Linn. A single specimen from Sussex. Equally as common in England and France as in America.

†*Myiatropia florea* Linn. Female, Horsham, early June, 1918. This species, which is the only member of the genus, is fairly common in Britain. It is intermediate between *Eristalis* and *Helophilus*, but appears to be more closely related to the former. The eyes are narrowly contiguous in the male; pilose; marginal cell open. The fly resembles *E. transversus* in markings.

HYPERA NIGRIROSTRIS FAB. IN THE PACIFIC NORTHWEST.*

BY L. P. ROCKWOOD,
U. S. Department of Agriculture, Bureau of Entomology, Forest Grove, Oregon.

Hypera (*Phytonomus*) *nigrirostris* Fab., is a clover insect of supposedly European origin[1] which, for many years, has been known to occur in the eastern states and eastern Canada. It has been recorded from as far west as Minnesota by Schwarz,[2] the most western point of which I have seen record, except as hereinafter stated. The insect is a very close relative of the Alfalfa Weevil, *Hypera postica*, and the discovery of its parasites in northwestern America is, therefore, thought worthy of record.

In 1916 Professor R. A. Cooley[3] reported this weevil from "one valley in western Montana," where the insect had been present "during the past two years." In May, 1915, the author found adults of *H. nigrirostris* at Bellevue, Wash., on the shore of Lake Washington opposite Seattle. The distribution of this insect in the Pacific Northwest has since been traced by members of the staff of the Forest Grove Laboratory of the U. S. Bureau of Entomology, Cereal and Forage Insect Investigations as follows:—*H. nigrirostris* was found in western Montana by C. W. Creel at various points in the Flathead Valley from Columbia Falls on the Great Northern Railroad to Dixon on the Northern Pacific Railroad, and also at Arlee, Montana, in the Jocko Valley, a short distance south and east of the Flathead Valley. West of the Cascade Mountains it has been found from Vancouver, B.C., on the north (by C. W. Creel) southward through Washington to its southern limits in Oregon at Garden Home in the Willamette Valley, Forest Grove, in the Tualatin Valley and Nehalem on the coast. Mr. Wm. T. Ham, of the Truck Crop Insect Investigations of the U. S. Bureau of Entomology, reports it in correspondence from Orcas Island, Wash., and Longmire's Springs on Mt. Rainier at an elevation of 2,761 ft.

In 1915 and 1916 *H. nigrirostris* was found in fair numbers at Bellevue, Wash. and Olympia, Wash. In 1917 this species was very numerous and doing considerable damager to clover on the grounds of the Western Washington Experiment Station at Puyallup. In the season of 1918 *H. nigrirostris* was discovered for the first time at Forest Grove, Oregon. Only three specimens were found in that locality during the entire season of 1918. It does not seem possible that this insect could have been present at Forest Grove prior to this year, as clover fields of the vicinity had been very carefully watched since 1914. In the season of 1919 the weevils were slightly more plentiful at Forest Grove, but still by no means common. The insects increased in numbers toward the north, that is toward the Columbia River and the Coast Range, beyond which they also occurred on the ocean front near Nehalem, Oregon. Every indication is that the trend of dispersion of the species is from the north to the south.

There is, however, an unusual phenomenon concomitant to this invasion of a new region by a well-known insect. It was stated above that but three specimens of *H. nigrirostris* were found at Forest Grove in 1918. One of these

*Published by permission of the Secretary of Agriculture.

1. Webster, F.M., U.S. Bureau of Entomology, Bulletin 85, Part 1, 1909.
2. Schwarz, E. A., Proc. Ent. Soc. Wash., Vol. 9, 1908, p. 114.
3. Cooley, R. A., 14th Annual Rept. Sta. Entomologist Montana, Bull. No. 112, p. 67, 1916.

specimens was a typical *H. nigrirostris* cocoon containing an Hymenopterous cocoon of a kind indistinguishable from that of *Bathyplectes curculionis*, parasite of the Alfalfa Weevil introduced into Utah from Europe. Later this parasite was found in about 50 per cent. of the early cocoons of *H. nigrirostris* at Puyallup, Wash. In 1919 adults of this parasitic species were swept from clover at Forest Grove on two occasions. The parasite was also found to be present at Nehalem on the ocean front, where the weevil larvæ were not very easy to find. This parasite has been determined by Mr. A. B. Gahan[4] of the U. S. National Museum as "*Bathyplectes exigua* Gravenhorst, a European species hitherto not recorded in the United States[5] and apparently without host record in Europe." This parasite, like other members of this European genus, is especially adapted to prey upon the larvæ of Hypera, the young larvæ of which it searches out in their concealed locations in the axilliary buds under the bracts on clover stems or under the flowering heads of clover. Thus we have a highly specialized parasite occurring even on the outskirts of the area infested by its host.

In addition this parasite of *H. nigrirostris* larvæ, a Pteromalid parasite attacking the pupæ within the lacy cocoons was found in fair numbers during the seasons of 1918 and 1919 at Puyallup, Wash., and Auburn, Wash. This parasite also shows a special adaptation for parasitism of Hypera, within the cocoons of which it occurs as naked larvæ or pupæ. However, it is not an active flier like *B. exigua*, and would probably spread more slowly than that species. It has not yet been found on the outskirts of the infested area. This parasite has been determined by Mr. A. B. Gahan as *Dibrachoides dynastes* Forster, a European parasite of the Alfalfa Weevil, *H. postica*, introduced into Utah but never recovered there so far as known to the author. This genus also, according to Mr. Gahan, was not represented in our fauna so far as known, previous to its discovery in Washington.

The occurrence in the Pacific Northwest of these parasites, apparently foreign to our fauna and not as yet found in the east, where *H. nigrirostris* has been known for many years and recently studied,[6] suggests that the invasion of the Pacific Northwest may be from a source different from that of eastern America. It is unusual for highly specialized parasites of an introduced species to become common so soon after the appearance of the host in a new region. It has been shown that *H. nigrirostris* is spreading from the north to the south in the Pacific Northwest. This seems to indicate that the species is really circumpolar in its range, as Schwarz[7] suggests, or that it has come from eastern Siberia by natural dissemination or accidental introduction. In the latter case the weevil was probably introduced by easy stages, such as would not eliminate the parasites, into the northern part of the Vancouveran faunal area of Van Dyke,[8] which he considers includes even the lower levels of the Aleutian Islands and the southern margin of the Alaskan peninsula.

4. My thanks are due Mr. A. B. Gahan for determinations of parasites and kind permission to use extracts from his correspondence.

5. Mr. A. B. Gahan informs me that a specimen determined by him as *B. exigua* was recently reared from a larva of *Hypera punctata* at Mechanicsburg, Pa., by Mr. T. L. Guyton.

6. Herrick, Glenn W. and Detwiler, J.D. "Notes on some little-known pests of red clover," Jour. of Ec. Ent., Vol. 12, No. 2, 1919, p. 206.

7. Schwarz, E. A., Proc. Ent. Soc. Wash., Vol. 9, 1908, p. 114.

8. Van Dyke, Edwin C. Annals of the Ent. Soc. of America, Vol. 12, No. 1, 1919, p. 1.

NEW SPECIES OF SCYTHRIS (MICROLEPIDOPTERA).

BY ANNETTE F. BRAUN,
Cincinnati, Ohio.

Scythris graminivorella, n. sp.

Head and face dark brown with a faint brassy lustre. Palpi dark brown, slightly paler inwardly and at bases of segments. Antennæ simple. Thorax and fore wings clothed with elongate dark brown, faintly brassy scales, and streaked with paler scales which form several more or less distinctly defined spots. There is a small spot on the fold at the basal third, preceding and following which the fold is darker than the rest of the wing surface, due to absence of paler scales; at two-thirds a large, ill-defined spot extending from the dorsal cilia about two-thirds across the wing, and separated from a spot in the apex by a darker unstreaked patch. Hind wings darker than fore wings, purplish brown. Legs dark brown, brassy. Abdomen dark purplish brown above, whitish beneath. Expanse 10.5–12 mm.

Type.—♂, Cincinnati, O.

The type and eight paratypes were reared from larvæ on *Hystrix patula*. The mine is an elongate transparent blotch with the entrance beneath* guarded by a broad tube of silk; the larva usually makes several mines. Although the species seems to prefer *Hystrix* as a food plant, I have observed the mines on Canada blue grass, *Poa compressa*. Larvæ collected May 5, produced moths during the first half of June.

The specimen which Zeller mentions in a note following his description of *S. pilosella* is probably an example of this species.

S. graminivorella is most closely allied to *S. imposicella*, but never shows the distinct markings of that species, nor the purplish tinge of thorax and fore wings. The indistinctly marked forms of *graminivorella* resemble the more yellowish forms of *eboracensis*, described by Clemens as *fuscicomella*. In this connection it may be worth while to note that I have bred the uniformly deep purplish black form as well as the yellowish form from larvæ in webs in tops of thistle. A large series of *eboracensis* from Louisiana are all of the dark form.

Scythris confinis, n. sp.

Face and palpi grayish; the palpi outwardly and at tips of segments dark brown. Crown, thorax and fore wings dark brown, slightly streaked with elongate golden brown scales, especially toward apex. A broad, golden brown stripe starts from near base and follows the fold, usually fading into the ground colour before reaching the margin. This stripe is bordered above and below with black, the black border especially on the upper side becoming broader near the wing margin. Hind wings and upper side of abdomen dark brown; abdomen beneath and legs paler, grayish. Expanse 10–12 mm.

Type.—♂ and 35 paratypes, Alameda County, California, May 22, 1908. (G. R. Pilate, collector).

S. confinis is of the same general type of marking as *S. perspicillella* Wlsm., but much darker and differently coloured.

*In *Hystrix*, the leaf blade is twisted near the base, so that the upper surface of the leaf aces downwards.

Scythris interrupta, n. sp.

Palpi dark brown, white inwardly and above except at tips of segments. Head, thorax and fore wings dark brown faintly shining. A gradually broadening white streak follows the fold from base almost to middle of wing, where it often abruptly becomes two or three times as wide. At two-thirds there is a more or less distinct white, elongate spot on the fold. Hind wings with veins 4 and 5 coincident; dark brown, almost concolorous with the fore wings. Legs dark gray. Abdomen dark brown above, beneath gray in the male, silvery in the female. Expanse 10 mm.

Type (♂) and seven paratypes, City Creek Canyon, Highlands, California, May 11.

Scythris ypsilon, n. sp.

Palpi pale yellowish shaded with fuscous beneath. Face pale yellowish. Top of head, thorax and fore wings pale golden. The fore wings are marked with three irregular, oblique white bands. The first of these crosses the extreme base to the dorsum, where it broadens greatly and passes obliquely upwards and outwards, joining the second band near the costa; the second band passes obliquely from the basal third of costa to near the middle of the dorsum, broadening below the fold. The third band extends from the costal two-thirds obliquely inwards to the dorsum, broadening on each side below the middle of the wing, and often enclosing on the dorsum a small spot of ground colour. Sometimes a minute white spot in the apex. Hind wings pale golden with a slight purplish tint. Abdomen pale golden above, anal tuft yellowish. Under side of abdomen and legs pale yellowish. Expanse 9.5–10 mm.

Type (♂) and eight paratypes, Loma Linda, California, June 30, July 11, August 21–31, and October 15. (G. R. Pilate).

Similar to *S. trivinctella* Zeller, but of a paler golden ground colour and with greater extent of white markings.

ENTOMOLOGICAL BRANCH.

Entomologist for Forest Insect Work in British Columbia Appointed.

Mr. Ralph Hopping has been appointed as Entomologist to take charge of the forest insect work in British Columbia, under the direction of Dr. J. M. Swaine, Chief of the Division of Forest Insects, and he commenced duties in December. Mr. Hopping has had a lengthy practical experience of forestry operations and forest insect control work in western forests. He has been attached to the United States Forest Service for twelve years, and for seven years he had charge of insect control work in the National Forests in California. During the war his territory included the States of Arizona, New Mexico and Colorado. Few men have had a wider practical experience of forest insect control operations, and Mr. Hopping is now engaged in planning and supervising control operations for bark-beetle outbreaks in southern British Columbia, where these insects have been responsible for extensive losses in valuable timber during the last few years.

NOTES ON THE WINTER COLEOPTERA OF WESTERN AND SOUTHERN FLORIDA, WITH DESCRIPTIONS OF NEW SPECIES.

BY W. S. BLATCHLEY,
Indianapolis, Ind.

During the winter of 1918–1919 I collected from December 1 to February 11, and from March 6 to March 30, about Dunedin on the west coast of Florida.[1] In the interim, February 12 to March 5, I made a trip to Cape Sable and Key West, stopping four days on the way at Lakeland. A number of interesting and a few undescribed species of Coleoptera were taken during the season, and of these, except the Rhynchophora which will be treated elsewhere, the present article deals.

Cape Sable, the extreme southern point of the mainland of Florida, is an interesting place, but as yet a difficult one to reach. I went with a party of land-seekers and tourists from Lakeland to Homestead, via New Smyrna, Palm Beach and Miami by automobile, thus passing clear across the State from west to east and 250 miles down the east coast, a route necessary to avoid bad roads. From Homestead to Long Key, an island 30 miles southeast of Cape Sable, we took a train on the East Coast Railway. At Long Key we were met by a small boat of the Cape Sable Land Co., which makes a weekly trip for mail and supplies from the "Club House" of the Land Co. This club house is located about three miles from the point of the cape proper. In fact, there are three capes or points, the eastern and middle ones, about six miles apart, being occupied to within 50 yards of the water's edge by cocoanut groves which contain about 40,000 bearing trees.

The country about Cape Sable differs much from other parts of Florida' being for the most part a low, flat region devoid of pine, saw palmetto and sand' the three dominant features of the usual south Florida landscape. The soil, or rather the surface, is composed of comminuted limestone and, except along the brackish inlets and sloughs, supports only a prairie-like vegetation of weeds and grasses. The houses, few and widely scattered, are raised high above the ground to avoid the tides which, during hurricanes or violent storms, often cover the country for miles. There is no fresh water, rain water collected in large square surface concrete cisterns furnishing the supply for the settlers. Along the inlets and in the lower depressions are the so-called hammocks, composed of a dense growth of subtropical shrubs and trees among which Spanish bayonet, tall cacti and other thorn-bearing vegetation so abound that collecting has to be done mostly along the margins. A single phrase from my notebook, viz., "a few fair things and a million mosquitoes," was the average record of each day's collecting about the Cape at that season. Late in the afternoon or on sultry days a "million" would be a very low estimate of the mosquito population. Several times they drove me out of the hammocks onto the open prairie where there was a little air stirring but poor collecting.

The net result of my week's enforced stay was, on the whole, disappointing. Of Coleoptera only Rhynchophora were found in any numbers, but of them a

1. See Can. Ent., XLIX, 1917, 137.

number were rare and interesting. I was glad when Thursday morn rolled round again and a start could be made for Key West. A new automobile road is being constructed from Homestead to Cape Sable, so that in a year or two the Cape can be more easily reached.

The island of Key West, where I spent five days, has been visited by many collectors and its insect fauna is well known. The conditions for collecting are, however, poor and growing worse. This is due to the lack of vegetation and fresh water—only a few stunted shrubs and trees remaining on the island. Here, as at Cape Sable, some of my most interesting captures were among the Rhynchophora. However, a Dytiscid, *Copelatus debilis* Sharp, new to this country,[2] was taken, and also a number of the species mentioned on the pages which follow. From Key West I returned to Tampa by steamer, and from there to Dunedin is a distance of only 27 miles.

Pasimachus strenuus Lec. On March 11 I found one of these large Carabids crawling backwards across a sandy roadway in Dunedin and dragging with him a specimen of the bulky Scarabæid, *Deltochilum gibbosum* Fab. The victim was still alive and had evidently put up a strong fight for existence, as both his fore legs and one of the middle ones were wanting. *D. gibbosum* appears to be a scarce species in Florida, having been taken by me but once before, when a half dozen were found in a putrid, extremely fetid mass of fungi in Skinner's Hammock near Dunedin.

Dicælus elongatus Dej. This species, frequent throughout Indiana, is seldom found in Florida. Two specimens were taken February 13 from beneath logs in low woods on the border of Lake Parker, northeast of Lakeland. Heretofore known from the State only by specimens taken by Schwarz at Enterprise, St. Augustine and Crescent City.

Lebia fuscata Dej. Two specimens were beaten from dead leaves of cabbage palmetto near Dunedin, one Jan. 29, the other March 19. It has been recorded from Jacksonville and Belleair, and is said to occur from Canada to Florida and Missouri.

Selenophorus fatuus Lec. Quite common beneath dead leaves near the crematory on Key West. With it were taken *Copelatus debilis* Sharp and *Casnonia pennsylvanica* L., the latter with the black spots of elytra very large and confluent.

Neoharmonia venusta fattigi, var. nov.

Differs from typical *venusta* in having the black markings of each elytron reduced to the two median spots, one round and submarginal, the other subsutural with a narrow prong directed forward. It is thus intermediate between the typical form and var. *dissimila*,[3] the latter having these median spots wholly wanting. Examples of all three forms were sent to me by Prof. P. W. Fattig, of Gainesville, who took them at Pahokee on April 25.

Psyllobora nana Muls. A single specimen was taken March 2 while sweeping near the Old Fort on Key West. It is a Cuban and Jamaican species,

2. See Bull. Amer. Mus. Nat. Hist., XLI, 1919, 312.
3. Can. Ent., XLVI, 1914, 66.

and has been taken by Berger on the Dry Tortugas and the Florida Keys. *P. parvinota* Casey was taken in numbers both at Cape Sable and Key West.

Hyperaspis nigrosuturalis Blatch. Several additional specimens of this handsome Coccinellid, which was described[4] from a unique taken at Lakeland, were collected near Dunedin in February by beating large bunches of Spanish moss in which they were hibernating.

Scymnillus eleutheræ Casey. Three specimens of this minute Coccinellid were beaten from the foliage of the Saffron Plum, *Bumelia angustifolia* Nutt., along the edges of a hammock at Cape Sable. It was identified for me by Col. Casey, who described[5] it from the Bahama Islands, this being its first record for the United States.

Scymnus dichrous Muls. A single specimen taken March 3 by beating at Key West. This species has not before been recorded from Florida, nor definitely from the United States. Mulsant's brief characterization and notes were as follows: "I have seen in the Chevrelat collection, under the name *Scymnus dichrous*, a specimen having the posterior fifth of the Elytra reddish white or reddish yellow, except that the suture throughout is widely bordered with black. Perhaps this specimen which seems to constitute a distinct species, may however be attached to *Scymnus ochroderus*." He gives no locality for *dichrous ochroderus* was from St. Bartholomew, West Indies.

Scymnus bivulnerus Horn. This species was taken both at Cape Sable and Key West. It was described in part from the latter place.

Mychocerus depressus Lec. Two specimens of this, the smallest of our Colydiidæ, were taken Dec. 11 from beneath bark of dead water oak near Dunedin. Horn gives[6] its range as "District of Columbia to South Carolina and very rare." It has not before been recorded from Florida, though mentioned in the Schwarz Mss. list from Tallahassee.

Apsectus hispidus Melsh. I can find no Florida record of this little bristly Dermestid. A single specimen was taken at Dunedin, March 19, from bottled, dead-leaf debris which was kept on account of its containing *Hormops abducens*[7] Lec. The Dermestid is said by Leconte[8] to occur in the middle and southern states on leaves.

Hister adonis, sp. nov.

Elongate-oval, moderately convex. Black, shining. Thorax with two marginal striæ, the inner one almost entire, the outer but little shorter; disk smooth. Elytra with one sub-humeral stria reaching the apex and a very fine, oblique humeral. Dorsal striæ five, entire, the fifth arching and joining the sutural, the striæ well impressed, evidently but feebly punctate; epipleuræ unistriate. Propygidium and pygidium both finely and rather sparsely punctate. Mesosternum truncate. Front tibiæ with four rather coarse teeth, the apical one entire. Length 5.8 mm.

4. Can. Ent., L, 1918, 420.
5. Jour. N.Y. Ent. Soc., VII, 1899, 115.
6. Proc. Amer. Phil. Soc., XVII, 1878, 592.
7. See Journ. N.Y. Ent. Soc., XXVI, 1918, 158.
8. Proc. Acad. Nat. Sci. Phil., VIII, 1854, 113.

Dunedin, Florida, Dec. 13. One specimen taken from beneath a board near the margin of a pond. A member of Horn's Americanus Group, allied to *sedecimstriatus* but larger, more oblong, with two nearly entire thoracic marginal striæ, but one sub-humeral and with dorsal striæ less impressed, less distinctly punctate. Not in the Leconte or Horn collections and not known to Col. Casey.

Saprinus obsidianus Casey. Three specimens of this highly-polished Histerid have been taken at Dunedin, Dec. 21–March 21, one in a bucket of water, the others at carrion traps. It was described from Mobile, Ala., and has not before been recorded from Florida.

Carpophilus rickseckeri Fall. Two specimens were taken by sweeping along the margins of an orange grove near Dunedin, March 17. It was originally described[9] from specimens taken in decaying cactus at San Diego, Cal., and Mr. Fall informs me that he has since seen specimens from Florida.[10]

Quadrifrons castanea Blatch. A second specimen of this very distinct Nitidulid was taken March 7. It was swept from low huckleberry bushes growing within 100 yards of the bay front one mile north of Dunedin. Both genus and species were founded (Can. Ent., 1916, 92) on a unique taken at Dunedin.

Ora texana Champ. Two specimens of this Dascyllid were taken at Dunedin Feb. 6 by beating a bunch of Spanish moss in which they were hibernating. It is the *Scirtes troberti* of Horn,[11] nec. Guer. and has been recorded before only from Louisiana and Texas, though known to Schwarz from Crescent City and Cape Malabar, Florida.

Melanotus parallelus, sp. nov.

Elongate and slender for the genus. Dark chestnut brown; antennæ, legs and last two ventral segments, pale reddish-brown; basal margin of elytra brighter reddish-brown. Antennæ slender, slightly longer than head and thorax, second joint subglobose, less than half the length of third, the latter nearly as long as, but much more slender than fourth. Clypeus flat, its disk coarsely and densely punctured, front margin very broadly rounded. Thorax one-half longer than wide, its sides straight and parallel from the tips of the long, acute hind angles almost to apex; disk rather finely and sparsely punctate, the punctures at middle separated by twice or more their own diameters, on sides distinctly closer, each puncture bearing a long, grayish-white prostrate hair. Elytra at base not wider than thorax, thence faintly but evidently and evenly tapering to apex; disc with rows of close-set rather coarse punctures; intervals slightly wider than the rows of punctures, each with two rows of very fine alternating punctures, each of which bears a long, prostrate whitish hair. Abdomen finely and sparsely punctate, the last segment with more numerous and coarser aciculate punctures. Length 8.7–9.5 mm.

9. Trans. Amer. Ent. Soc., XXXVI, 1910, 124.

10. This is probably the *Carpophilus humeralis* Murry, mentioned by Leng (Journ. N.Y. Entom. Soc., XXVI, 1918, 205) as having been introduced at Oneca, Fla. If so Fall's name is a synonym.

11. Trans. Amer. Ent. Soc., VIII, 102, pl. 1, fig. 15.

This is apparently a common winter *Melanotus* in Florida, having been taken by me at Ormond, Sanford and Dunedin, Feb. 27–Apr. 15. About Dunedin it occurs especially in early spring on the tall scurfy Ericad, *Xolisma ferruginea* Walt. which grows in clumps in very dry, sandy spots. It is especially notable for the long, parallel-sided thorax and peculiar punctuation of the last ventral.

Melanotus perplexus, sp. nov.

Size medium, form moderately slender. Occiput, apical third of thorax, elytral suture and under surface dark chestnut-brown; basal portion of thorax and elytra except suture, reddish-brown; antennæ and legs pale brown. Antennæ stout, strongly serrate, reaching basal third of abdomen, joints one and two very short, subequal, subglobose, the two united less than half the length of fourth, the latter slightly longer than fifth. Clypeus densely and coarsely punctate, feebly concave, its front margin narrowly rounded. Thorax but slightly longer than wide, the centre of its disk notably convex, widest at middle, the sides evidently but not strongly curved; hind angles short, feebly divergent; disk finely, evenly and rather closely punctate; basal third strongly declivent, the concavity between base of thorax and that of elytra very deep and long. Elytra at base as wide as middle of thorax, thence very feebly narrowing to the rather bluntly rounded apex; striæ distinctly impressed, their punctures round, close-set; intervals as wide as the striæ, each with two irregular rows of minute punctures each bearing a very fine, short, white prostrate hair. Abdomen finely and rather closely punctate, the last two segments both densely punctate and pubescent. Length of body 8–8.2 mm.

Dunedin, Fla., June 10, July 5, two specimens taken at light. The colour and short, convex thorax with large, deep basal concavity are the distinguishing features of this species.

Taphrocerus puncticollis Schwarz. I find that I have heretofore erroneously identified this species. It is our largest member of the genus, 5 to 6 mm. in length, bluish-black, the elytra without, or with very faint, pubescent patches, their surface more or less rugose and with strial punctures somewhat confused. A half dozen specimens were taken near Lakeland, Feb. 16, from between the leaf-sheaths and clumps of a saw-grass growing in clumps along the margin of a lake.

Trichodes apivorus trifasciatus Sturm. A specimen of this large and handsome Clerid, taken at Gainesville May 23, is at hand. It was sent me by P. W. Fattig. The species is listed by Schwarz as "very rare" in Florida.

Hydnocera verticalis Say. A variety of this well-known northern form, having the thorax with only narrow lateral and median stripes piceous; head and elytra wholly pale or the former with a faint fuscous blotch on occiput, occurs in Florida. A specimen was beaten from Spanish moss at Lakeland, and another is at hand from Lake City. The species has not before been noted definitely from Florida.

(To be continued.)

RECENT CANADIAN PUBLICATIONS.

(Continued from p. 24.)

FROM LE NATURALISTE CANADIEN:—

Odonates des environs de Saint Alexandre, Ironside, P. Q. By L. M. Stöhr. Vol. XLV, No. 6, Dec., 1918, pp. 81–85. Forty-one species are recorded, of which five are new to the Province of Quebec.

Un probleme entomologique. (Editorial.) Vol. XLV, No. 8, Février, 1919, pp. 116–117. Records the capture of the noctuid moth, *Stretchia plusiæformis* Hy. Edw. at Chicoutimi, a species otherwise known only from western North America.

La guerre aux coquerelles. By P. Fontanel, S. J. Vol. XLV, Dec., 1918, pp. 86-93; Jan., 1919, pp. 104-110; Fév., 1919, pp. 117-126. The habits and methods of destroying cockroaches are described, including formulæ for various insecticides.

Les Coleoptères du Canada. By J. I. Beaulne. Vol. XLV, Nov., 1918, pp. 76–79; Dec., 1918, pp. 93–95; Jan., 1919, pp. 104–110; Fév., 1919, pp. 117–126; Mar., 1919, pp. 140-143; Avr., 1919, pp. 157-160; Mai, 1919, pp. 173-175; Juin, 1919, pp. 186-191; Vol. XLVI, Août, 1919, pp. 45-48; Sept., 1919, pp. 69-72; Oct., 1919, pp. 94-96; Nov. 1919, pp. 117-120. These parts deal with the Hydrophilidæ, Silphidae, Scydmaenidae and Pselaphidae.

La protection des plantes chez les Romans. By Georges Maheux. Vol. XLV, No. 10, April, 1919. An interesting paper, describing the methods employed by the Romans in combatting the ravages of insect enemies of cultivated plants, including cereals, vegetables and fruit trees.

La Lycie vulgaire. By J. C. Chapais. Vol. XLVI, No. 2, pp. 22-27. Notes on the habits, life history, and protective mimicry in the geometrid moth, *Lycia cognataria* Guénée.

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA.—Feb., 1918. No. 12. Systematic Series. Victoria, 1919.

This report of 39 pages contains the following papers and addresses:

Presidential Address.—By E. H. Blackmore. Pp. 5–9. Contains brief accounts of the work of the more active members of the Society.

Life-history of the Leaf-eating Crane-fly Cylindrotoma splendens, Doane (Tipulidæ, Diptera).—By Alfred E. Cameron. Pp. 9–12; 1 pl. An interesting account of the life-history of this peculiar crane-fly, whose larva, unlike those of most Tipulidæ, feeds upon the leaves of various plants, both terrestrial and aquatic, and is protected by its green colour and habit of dropping to the ground when disturbed.

Reared adults copulated in captivity soon after emergence, and eggs were deposited on the undersides of the leaves of potted plants of the false bugbane (*Trautvetteria grandis*). These were reared through to the adult stage. Descriptive notes are given of these stages, the peculiar structure and function of the ovipositor, and other features of the life-history. Detailed descriptions of the egg, larva and pupa of this insect appeared in the Annals of the Entomological Society of America, vol.

Notes on a Collection of Hemiptera.—By W. Downes. Pp. 13–16. This paper is an annotated list of Homopterous insects of the families Cicadidæ,

Cercopidæ, Membracidæ, Cicadellidæ and Fulgoridæ, taken chiefly by the author in the vicinity of Victoria and on the Saanich Peninsula to the north of the city, though a few were collected in the Okanagan District. Dates of capture are given for nearly all the species. The list numbers 61 species, and as little is known of the Hemiptera of British Columbia it is a welcome contribution to our knowledge of the subject.

A Revision of the British Columbia Species of the Geometrid Genus Hydriomena Hub.—By E. H. Blackmore. Pp. 19–26. This paper gives a brief review of recent work on this genus, leading up to its present clearly defined status; followed by notes on the characters of recently-described species from British Columbia, with particular reference to the form of the uncus. Figures of this structure are given for 16 species and varieties. Of the 68 species described from North America north of Mexico 20 have been taken in British Columbia, and 18 of these are reported from Vancouver Island. The paper concludes with a complete list of the British Columbian species.

Notes on the Aeolothripidæ.—By R. C. Treherne. Pp. 27–33. A valuable synopsis of this family, which is the most generalized of the order Thysanoptera. Notes on the taxonomic position of the family are followed by keys to the subfamilies, genera and species. There are 7 genera and 16 species discussed, 9 of the latter belonging to the genus Aeolothrips. Characters other than those of the wings are used, on account of the occurrence of brachypterous forms in some of the species. Antennal and wing characters of the species of this genus are illustrated. Unfortunately there are no references to distribution of the species.

Three Years Collecting in the Lillooet District.—By A. W. A. Phair. Pp. 34–36. Describes a collecting trip to the summit of Mount McLean with the main object of capturing *Oeneis beani*, in which the author was successful. On this and subsequent trips a number of other interesting alpine Lepidoptera were taken. The mountain is described as a remarkably rich collecting ground and is easily reached from the town of Lillooet.

Natural Control Investigations in British Columbia.—By John D. Tothill. Pp. 37–39. Mr. Tothill, whose work on the natural control of the Forest Tent Caterpillar and the Fall Webworm in New Brunswick is well known, investigated these insects in the West in 1918. The Forest Tent Caterpillar was studied at Red Deer, Alberta, where a serious outbreak has been in force for three years, and in the Lower Fraser Valley, where conditions are unfavorable for the insect. In the former locality the parasites which usually serve to bring this insect under control, were not found, but in the Fraser Valley and on the lower end of Vancouver Island these parasites were present in numbers, preying upon the Western Tent (*M. pluvialis*); and the author suggests that it would be well worth while to collect these for liberation at Red Deer.

An undescribed Tachinid related to Compsilura is the most important factor in the control of the Fall Webworm in British Columbia, and attempts will be made to introduce it into the region east of Winnipeg.

The mite *Hemisarcoptes malus*, the most important single factor in the control of the Oyster Scale in the Eastern Provinces, but which has been unknown in British Columbia, has been liberated at several points in this Province, and will be kept under observation for the next few years.

Mailed February 28th, 1920

PHYCIODES BATESI REAK., AND *P. THAROS* DRURY.

(See p. 59).

The Canadian Entomologist

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POPULAR AND PRACTICAL ENTOMOLOGY.

A Soldier's Collecting Day in France.

BY RICHARD T. GARNETT,
Oakland, California.

We were stationed away back of the lines but when they were putting over a big drive we were busy handling supplies, so that I was not sorry when a lull came that allowed me a day off.

I was stationed in the heart of Burgundy at Beaune, near the edge of the little range of hills known as the Cote d'Or. Here the forest-covered hills come down to meet the town, and it was to these hills that I made my way on this particular morning.

I had hardly started out the Faubourg when what should I find sitting on the sidewalk but a splendid specimen of *Lamia textor* Linné. This longicorn resented my grasping propensities very much and tried his best to bite a piece from my thumb. A little more and the town Octroi or limits was past, and on turning over a stone a fine large specimen of *Carabus coriaceus* Linné was acquired. In like manner under a neighbouring rock were picked up three more of the same and two *Carabus violaceus* Linné. Decidedly the species were well known, but they had charm for me as it was a new hunting ground. *Carabus auratus* was soon added to my list of discoveries, and it was not long and I had a fair series of each. A little further on I came to an apple tree with a little fruit on it. In response to a hearty shake of the tree I was rewarded by several hundred lively specimens of *Melolontha vulgaris* Linné, who "possumed" dead long enough for me to gather all I wanted, and then took wing. The leaves of this tree I found on closer examination were in a sad state of dilapidation due to these ravenous Scarabs.

A little bit further on I found several *Cetonia aurata* Linné, and a great many *Cetonia hirtella* Linné upon the flowers of mustard. A rose in a nearby garden yielded from its heart a *Trichius fasciatus* Linné. A few stones on the hillside yielded several specimens of *Pterostichus vulgaris* Linné, and a little further on a single rock provided cover for at least thirty specimens of that pretty little Bombardier, *Brachynus plagiatus* Reiche. Continuing this sort of collecting I soon added some more *Carabus auratus* Linné to the bag as well as several *Abax ater* Vill. and *A. parallelus* Dftsch.

On coming to a fallen log in a moist condition I removed from their snug position beneath the bark a series of *Uleiota* (*Brontes*) *planata* Linné, and several *Hispella atra* Linné. A little further on some manure yielded a pair of *Geotrupes sylvaticus* Panz. and one *G. stercorarius* Linné as well as several Staphylinidæ unknown to me. A little further on I captured as it ran along on the edge of a pine grove a fine specimen of *Carabus marginalis* Rz, a very lively and speedy runner. This pine grove was exceptionally well cared for, all fallen limbs and

undergrowth being kept cleared out, so that outside of a few specimens of Carabidæ I got nothing there for my pains.

A little further on beneath a very old log my patience was rewarded by three specimens of *Lucanus cervus* var. *capra*—the variety with the short mandibles in the male. I later took the typical form, *L. cervus* Linné flying at dusk in the outskirts of Paris. Both of these latter I took at the same place exactly, the female one evening and the male the following evening. Both were on the wing, and I was attracted by their buzzing flight.

But to continue my history of this my first day in a new field, I proceeded on until mid-afternoon finding many old friends in a live condition more interesting than they had been in my collection. Everywhere on the deciduous trees were to be found swarms of *Melolontha vulgaris* and an unknown little weevil which also defoliated. I was just putting a pair of *Clivinia fossor* Linné into my vial when I noticed that the sun was low, and as I had to be on duty again at seven that evening it behooved me to hurry a little and return.

Thus closed my first experience in a strange land, and how I gloated over them when I packed them away that evening.

A REMARKABLE CASE OF HOMING INSTINCT. (HYMEN.)*

BY C. N. AINSLIE,
Bureau of Entomology, Sioux City, Iowa.

August 31, 1919, was hot, dry, dusty and windy in Mandan, North Dakota, where the writer was spending the day. The wind was from the west, gusty, and at times almost reached the velocity of a gale.

Late in the afternoon as the writer was returning from a stroll, a flash o-green from the grass beside the walk attracted his attention. A brief investigation disclosed the fact that a lady Sphex (or Ammophila)* had secured a green lepidopterous larva more bulky than herself and was trundling along with her prey swung beneath her body, one end of the larva being held in a firm grip by her jaws, the other supported in some manner by her legs. Its weight was clearly greater than that of the wasp herself, but she was evidently fresh and moved quite briskly at first.

She came out almost at once upon the cement walk that was being swept by the wind. When she felt its force she adopted the policy of least resistance and drifted before it for at least twenty feet eastward, running, walking and hopping in an effort to maintain her balance. For the time she was helpless. Finally she hove to and headed directly into the wind, going due west. Her progress was of course slow, but she persisted and managed to struggle along for a distance of about fifty feet, with occasional pauses for rest.

During this journey her prey must have shown signs of returning animation for at one point she stopped, adjusted her burden and, arching her slender waist, aimed her ridiculous little bulb of an abdomen directly downward. A few swift stings reduced her helpless victim to absolute submission, and during the remainder of the performance she had no more trouble of this sort.

After moving nearly fifty feet directly into the wind she seemed to realize

*Published with the permission of the Secretary of Agriculture.
*Determined by Dr. H. T. Fernald, of Amherst, Mass., as *Sphex vulgaris*.

something wrong and wheeling about went careering down the walk, driven by the breeze to the east. She slowed up as much as she was able, but just as she reached her former turning point an unkind gust struck and upset her, compelling her to let go of the worm while she struggled to her feet. The worm was carried half a yard beyond her and left in plain sight on the walk. She was bewildered for a few moments, then began an agitated search for the lost prize. Her eyesight was evidently of little use, for at first she walked about in an aimless manner but was soon travelling in circles like a dog locating a scent. As this produced no results she rose to wing and sailed above the walk, her long legs just trailing the surface of the cement as she flew. The circles gradually grew larger and she varied flying with running, always keeping close to the surface. The search appeared to be hopeless when all at once, in one of her wider sweeps, she managed to stumble across the outstretched worm. Instantly she straddled it, grasped it with her jaws and again headed west into the wind. Just why she spent so much valuable time chasing up and down this walk will always remain a mystery for, as subsequent history shows, she was merely wasting time and getting nowhere. But the facts are recorded as they occurred.

This excursion took her fully seventy-five feet into the wind, and she walked, hopped, ran and flew in short flights as if in haste to arrive somewhere. At brief intervals a short rest was taken, for the muscular exertion must have been tremendous in the teeth of the gusty wind with the load she was carrying.

Once more, and for the last time, she turned squarely about and headed east. She blew along in spasmodic fashion, now fast, now slow, seldom pausing even for an instant. At times she would run headlong for a yard or more, her abdomen held high in air and her long legs racing. Then she would make leaps of a foot or more, several in succession, then perhaps drag herself wearily along for a few steps as if tired out. For a hundred feet she drove with the wind to the east. Then, in some unknown way she got her bearings and turned directly into the grass lawn, moving south. This was really the most trying part of her entire trip, for although she was out of the wind she was at once involved in a jungle of tangled, close-clipped grass tufts through which she had to thread her way. Necessarily her route was far from being an air line since she had to accommodate herself to the surface obstructions and go around where she could not go through. This fact of itself must have embarassed her in finding her destination, at least a human, like you or I, would undoubtedly have lost our way under similar conditions. But she kept steadily on, followed as closely by the writer as was deemed wise, although she appeared oblivious of his presence during the entire episode.

During her lawn journey she was first in the shade of one house, then of a second. Each time she emerged from the shade she topped and stretched herself in the grateful warmth before continuing. The second time she did this she released her victim and walked away a few steps. Returning, she almost immediately straddled the prize to pick it up but had evidently made the mistake of changing ends, for she promptly reversed her position and then seemed satisfied. Up to now she had been going mainly south but all at once changed her course and went southwest as if she were steering by some invisible star, and from that time until she reached her destination, held consistently on this new quarter. The vicious wind that blew directly across her line of march

precluded any theory of scent affording any aid to the wasp in reaching her burrow, and she certainly could see no landmark to assist her in steering her way.

Once an active grasshopper came bounding across her path and forced a change en route, a detour of a few inches. Later, another hopper, sitting in the grass near her route caught sight of her as she toiled toward him. With baleful eyes he glared at her, swung slowly about as she came closer and just as she passed him made a short, spiteful spring directly at her, giving her a violent kick and upsetting her completely. It was coarse comedy on his part, but might have proved tragedy for her. She meekly righted herself and trudged steadily on. Still further along, another wasp of the same species as herself crossed her track at right angles just ahead of her. She saw the newcomer, stopped short and flattened herself to the ground for a few seconds until her fellow raider had passed on.

At last, after crossing two lawns, two concrete walks leading to the houses she had passed, and going some distance into a third lawn, making fully one hundred feet of grass travel, she swung sharply at right angles and made a rapid run of about two inches. She was all animation now, dropped her load, jumped forward and seized in her jaws a pebble that lay before her. Its removal disclosed an opening in the earth down which she instantly plunged, to reappear almost as suddenly. The worm was grasped and dragged beneath the surface quickly. Twice more she came to the top and, sad as it seems, was captured the last time for the writer's cabinet.

This wasp with her heavy load had travelled in all more than 300 feet, had apparently lost her way at first yet had in some mysterious manner succeeded in steering herself with uncanny accuracy to her destination. How did she do it? It is possible but not probable that she had already been over the same route on foot and was merely following her own scent. But she appeared to enter the lawn in a haphazard manner, and any well-laid plans she may have had must have been much interfered with by the annoying wind as well as by the unexpected obstacles she encountered along the way. The mouth of her burrow was many feet from any prominent object that might have served as a landmark to guide her, and for nearly half an hour she was involved in a grass forest from which she could have seen but little of the outside world. All the while she acted as if absorbed in the petty details of the journey, but she must, in spite of this, have been feeling her way in some exceedingly definite direction and this super-sense, call it instinct or what you will, brought her to precisely the right spot.

These facts are a transcript of notes that were continuously recorded while following the wasp, and are neither coloured nor altered to make a good story.

At the recent meeting of the American Association for the Advancement of Science, held at St. Louis, the Council unanimously elected Dr. C. J. S. Bethune, Professor of Entomology at the Ontario Agricultural College, Guelph, a Fellow Emeritus "in recognition of his long and faithful membership."

Dr. Bethune has also been made an Honorary Life Member of the American Association of Economic Entomologists "because of his long membership in the Association and as a slight token of its appreciation of his work in Entomology."

OBSERVATIONS ON THE MORE COMMON APHIDOPHAGOUS SYRPHID FLIES. (DIPT.).

BY C. HOWARD CURRAN,
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During 1913 at Guelph, 1914 at Orillia, and 1915 and 1919 at Vineland, the immature stages of many species of Syrphidæ, but more especially the aphidophagous or aphid-eating forms, have been studied by the author. As the study of these flies is of considerable interest to the fruit grower and gardener, owing to their beneficial habits, the observations made chiefly concern such species as were found to be of the greatest economic importance

Species belonging to four genera, Syrphus, Allograpta, Sphærophoria, and Paragus have been especially studied with the view of obtaining information as to their importance in the natural control of aphids injurious to farm crops. No suggestion is made here that any one species is of greater importance than another, although it is quite evident that the species discussed are of more importance than others, due to the fact that they are, for the most part, very common.

It has been found that Syrphid larvæ of all species are more or less heavily parasitized, some years much more severely than others. During 1919 parasites were over twice as numerous as during 1915.

Difficulties occur in the study of these larvæ, such as the almost complete absence of food at some periods of the year. Thus, during the past season, Syrphid larvæ were particularly numerous on small aphid colonies early in the summer, but it was found to be impossible to secure sufficient aphids for food, as some species cannot thrive, except on a particular type of aphid. But during the early part of the past season even general feeders, such as *Syrphus americanus*, could not be reared successfully.

The eggs of aphidophagous Syrphidæ are laid singly on the leaves or stems of plants, either in or near an aphid colony. They are creamy-white, but in many cases become grayish after one or two days. They vary in size according to the size of the fly.

The larvæ are more or less flattened beneath, without true legs, and often with fleshy, spine-like protuberances. They vary in shape, colour, size and convexity, according to species.

The pupæ of our common species resemble each other to a considerable extent. Pupation, however, may take place either in the soil, or on the plant. In one case, at least, it occurs in either place.

The more important species are dealt with regarding their feeding habits and abundance.

Allograpta obliqua Say. This is one of our most common syrphus flies and is common during the whole season, from May until October.

The larva is a very general feeder, having been found during the past season on *Aphis brassicæ*, *A. rumicis*, *A. cardui*, *A. pomi*, *A. gossypii*, *Myzus cerasi*, *Macrosiphum*, sp. on wild lettuce (*Lactuca canadensis*) and *Macrosiphum* sp. on wild aster (*Aster* spp.).

On all hosts except *Aphis pomi* this species was very abundant. In the

case of *A. pomi* the aphids were usually too much exposed to the direct rays of the sun to afford the shelter required by syrphid larvæ. On *M. cerasi* and *A. brassicæ* it was exceedingly common and a very important check. About 50% of the larvæ were parasitized during last year.

Sphaerophoria cylindrica Say. An exceedingly common species, found in abundance from early May to early November. The larva is a general feeder, but prefers aphids found on low-growing plants. It and the larva of *A. obliqua* are very similar, and without close examination are ordinarily considered as the same species. They are found on the same plants as the preceding, and the remarks on that species apply here also.

Syrphus americanus Wiedemann. Is a well-known member of the family. It is common in orchards and gardens, especially where plants are infested with aphids. During 1919 the larvæ were found feeing on *Aphis brassicæ*, *A. rumicis*, *A. cardui*, *A. pomi*, *A. gossypii*, *Macrosiphum* sp. on wild lettuce, and *Myzus cerasi*.

The larvæ are quite common on all the hosts mentioned above. It is of considerable economic importance as a check of aphids attacking cultivated plants and fruits.

Syrphus ribesii Linné. Larvæ found attacking: *Aphis brassicæ*, *A. cardui*, *A. pomi* (apple and pear). *A. gossypii*, *A. viburnicola*, *Myzus cerasi*, *Eriosoma lanigera*, *Macrosiphum pisi*, and *Macrosiphum* sp. on wild lettuce.

Syrphus ribesii is probably the best known member of the family, and is very common in orchards and gardens. Unfortunately this species and others are frequently mistaken for bees, and are often killed in mistake for such. It is probably the most important species in the orchard, where it occurs in moderately large numbers throughout the season from early May to November, attacking especially *Aphis malifoliæ* and *A. pomi*, and to some extent, the Woolly Aphis of the apple. It is the most common species attacking currant aphids, and is usually very common during October on Viburnum, where the larvæ attack the return migrants and sexual females of *Aphis viburnicola* and *A. rumicis*.

The larvæ are also found in large numbers in vegetable gardens on cabbages, etc., which are infested with aphids. They usually prefer well-shaded places, such as curled leaves or dense foliage, but are often found in more exposed positions.

Syrphus torvus Zetterstedt. Is an extremely important species. During the first warm days in spring the adults emerge and eggs are laid on the first colonies of aphids appearing on the shoots of various plants. The young larvæ develop on clusters of stem mothers and often wipe out whole colonies. Again in the autumn it preys upon the return migrants and sexual females, in addition to living upon summer forms of aphids upon various plants.

Paragus tibialis Fallen is rather common in Ontario. The larvæ are enemies of the pea aphis (*Macrosiphum pisi*), but I have observed them more frequently attacking *Aphis cardui* on thistle.

Paragus bicolor Fabricius is similar in habits to the preceding, but is much less common.

Observations on the Number of Aphids Destroyed by Syrphid Larvæ.

In order to obtain specific data on the number of Aphids destroyed by a single larva during the larval stage, newly-emerged larvæ were isolated on plants and a count kept of all aphids consumed. This was done by adding fresh aphids each day, in the numbers likely to be eaten. No count was kept of the aphids which were born on the plants, but these would not be numerous. However, it may be taken for granted that the figures given in the accompanying table are slightly below the average, although they are the average of numerous experiments conducted.

TABLE SHOWING DURATION OF IMMATURE STAGES AND NUMBER APHIDS DESTROYED.

Species	Number of Exp'ts	Duration of Egg Stage	Duration of Larval Stage	Duration of Pupal Stage	Average Total Aphids eaten by one Larva	Average Daily Consumption
		Days	Days	Days		
Allograpta obliqua	9	5–10	12–20	5–13	265	17
Sphaerophoria cylindrica	8	6–12	16–27	5–10	530	24
Syrphus americanus	10	5–12	8–11	8–15	474	47
S. torvus	5	——	14–20	10–20	242	15
S. ribesii	8	6– 8	14–24	12–24	312	19

Note.—The larvæ were fed upon Aphis pomi and A. malifoliæ in these experiments.

As shown by this table there is considerable variation, between species, in the total average number of aphids destroyed, and in the average daily consumption.

It may be noted that the number of aphids eaten or destroyed by a larva will depend, to a great extent, upon the abundance of food and the size of the aphids. In the field it was found that where food was very plentiful, the larvæ often killed two or three aphids in succession, but did not suck them dry. Also, in such cases, the larval and pupal stages appeared to be of shorter duration. As the development of the larva depends to a very great extent upon the abundance of food, it is safe to state that such abundance stimulates the insect to more rapid maturity. This fact was clearly demonstrated in the insectary, as the duration of both the larval and pupal stages was markedly shorter in cases where larvæ were reared on aphid colonies, rather than upon a certain number of aphids per day.

Again, the time of the year has a great effect upon the development of the larvæ. In warm weather growth is much more rapid. Larvæ feeding upon colonies of stem mothers are of more importance than those feeding upon summer colonies, as the stem mothers are more productive, and their destruction means that for each one destroyed, possibly millions of aphids will not be brought into the world, as each stem mother is the progenitor of inestimable numbers.

This brief outline of one phase of the work on the immature stages of Syrphidæ merely furnishes the basis for further extensive work. It might be pointed out that besides the determination of the economic value of the various species, considerable information on the systematic classification of the various species and genera is obtained from such investigations.

NOTES ON THE LIFE-HISTORY OF PHYCIODES BATESI REAK. (LEPID.).*

BY J. McDUNNOUGH, PH.D.
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Phyciodes batesi Reak. is one of the specialties of the Ottawa district. Like *Plebeius scudderi* it extends eastward from Manitoba through northern Ontario into Quebec and thence down the White Mountains, Adirondacks and Alleghanies into Virginia; although widespread it is apparently, for some unknown reason, restricted to a few isolated localities; further intensive collecting may, however, show that it is more common than we think and that its apparent rarity is due to the fact that it has been confused with *tharos*. I first made its acquaintance in the spring of 1918 when visiting Ottawa for the purpose of arranging the National Collection of Lepidoptera; noticing local specimens of this species in the collection I enquired where they had been obtained, and learned from Mr. A. Gibson that the species was rather common at Queen's Park, Aylmer, a summer resort about twelve miles up the Ottawa River and situated on the Quebec side. I was fortunate enough during the last week of May to obtain a good series of freshly emerged males, no females being obtained until nearly a week later, during the early part of June. The species was extremely local and frequented the lower dry slopes of a small ridge which at this point parallels the Canadian Pacific Railroad tracks; the area in question was adjacent to a wood but was itself rather open and covered with a miscellaneous growth of small bushes and plants among which a species of *Aster* with heart-shaped leaves was quite conspicuous. The same year stray specimens were taken at Chelsea, Que., on the Gatineau River, and other adjacent localities, but nowhere, except at Aylmer, did the species appear in any numbers.

This past spring (1919) *batesi* was even more numerous than in 1918 at its haunts in Aylmer, and by confining several females in a glass jar containing plants of the above-mentioned *Aster* species I was successful in securing a large batch of eggs. I further discovered a colony of freshly emerged larvæ on the same food plant at Aylmer. The ova laid in confinement on June 7th hatched on June 18th; the first pupa formed on July 14th and emerged on July 22nd, the remaining larvæ pupating during the following fortnight and emerging in due course, the last date of emergence being August 10th. Of the batch of young larvæ found in the open only about one-third fed up, pupated and reached the adult stage; the remainder stopped feeding after the third moult and remained quiescent in some secluded corner, evidently preparing for hibernation. It seems evident, therefore, that under natural conditions *batesi* (in the Ottawa region at least) is normally single-brooded with a partial second generation occurring under favourable conditions. That the ova laid in confinement all produced adults in the same year is probably due to the fact that shortly after being deposited they were subjected to intense heat, the jar in which they were contained having been left for a whole morning in a very hot sun.

As is only natural, the larvæ of *batesi* are very closely allied to those of *tharos;* in one feature, however, they appear to show a distinct difference, viz., that in their early stages, up to the third moult, they live gregariously on the

*Contributed from Entomological Branch, Department of Agriculture, Ottawa, Canada.
March, 1920

underside of the leaf in a fine web, whereas Scudder emphatically states of *tharos* (Butt. New Eng. I, p. 637) that "not the slightest web of any kind is spun." With regard to the adults they are, in the male sex at least, quite readily separable from *tharos;* apart from the fact that they appear at least ten days earlier on the wing than *tharos* in this vicinity, the narrowness of the orange-banding on the upper side of both primaries and secondaries is quite characteristic; a comparison of our figures 2 and 6 will show that in *batesi* the first extra-discal row of spots is well separated by the black ground colour from the following series of spots, whilst in *tharos*, especially on the secondaries, there is a strong tendency for the two rows to coalesce; in *batesi* this same inner row of spots on the primaries is distinctly paler in colouration than the remaining orange spots, a feature which, to my mind, throws the species into the *campestris—camillus* group, in fact, I have little doubt that *batesi* is the eastern representative of the West Coast *campestris*. On the underside of secondaries the male of *batesi* almost entirely lacks the dark semicircular patch so characteristic of *tharos* (vide figs. 4 and 5). In the female all these points of distinction fail to a greater or less degree and individual specimens are often extremely difficult to place correctly. Up to the present time nothing regarding the life-history has, to my knowledge, been published: I therefore append a more detailed account of the various stages.

Ovum.—Very similar to that of *tharos* (according to Scudder's description); pale green, conical, with truncate apex, base slightly rounded. The lower half of the sides and the base covered with numerous small, slightly depressed, hexagonal cells; upper half with about twenty vertical ribs, slightly raised. Surface of the truncate apical portion very faintly reticulate, almost smooth Height .66 mm., width of apex .2 mm. Greatest width (at about 1/3 height), .5 mm.

Larva.—Stage I. Head black-brown, broader than first segment, with lobes well rounded and divided posteriorly; hairs short, whitish. Body pale ochreous (greenish after feeding) with long, single, whitish hairs arising from minute tubercles. Prothoracic plate slightly darker than surrounding integument, broad, lunate posteriorly, with the lateral anterior edges forming a slight angle centrally at their junction point. Along the anterior margin six hairs overhang the head, three on each side of the centro-dorsal line; subdorsally on the posterior margin are two additional hairs. On the abdominal segments tubercle I is situated subdorsally about the centre of the segment; its long white seta is inclined forward. Tubercle II is well laterad to I and near the posterior margin of the segment; its seta is very short and points slightly backward. Tubercle III, situated centrally on the segment, bears a long hair similar to I, curving outward and forward; IV is slightly nearer the posterior margin of segment than III, V is in line with III, each with a fine white seta, directed outward; VI and VII represented by single hairs near the base of prolegs. In late stages of this instar the incipient spines of the following instar may be seen as large round disks which do not coincide in position with the primary tubercles. Length 2 mm.

Stage II. Head black, small, with rather sparse long hair. Body pale ochreous with greenish tinge. The primary tubercles have disappeared and the customary spines are now present. Prothorax without spines but with

well-developed dorsal plate containing six long, black hairs on anterior margin, overhanging the head, and two hairs on the posterior margin; several very short secondary hairs are also interspersed; laterally, on prothorax, a small hair ventrad to the plate and a raised tubercle with central long hair and several short ones on the lateral flange. Extending from the first abdominal segment is a centro-dorsal row of spines, each spine with terminal long hair and about seven others at various heights on it, decreasing in size as base of spine is approached. A subdorsal row of spines extends over all the segments but the prothorax, the spines being noticeably larger on thoracic segments, each with terminal hair and 11–14 others between apex and base: a similar supra-spiracular row is present with rather fewer hairs on each spine; a subspiracular row is found on abdominal segments only, being represented on the thoracic segments by two small hairs. A tuft of hairs placed on a small tubercle is found at the base of the legs and prolegs. The length of the spines is about equal to the width of the segments. Length 3½ mm.

Stage III. Head black-brown, with pale front (clypeus) and mouth parts; the apex of each cheek (epicranium) is well rounded and the central suture deep; on each lobe a pale stripe is present extending downward from apex to a point midway between mouth parts and apex. Body green, with very prominent white spines thickly covered with black-brown hair; the supra-spiracular spine is preceded by a lunate patch of brown at its base, best defined on the posterior segments. In late stages the dorsal and lateral lines turn dirty brown and a pale subdorsal line crossing the spines is evident. Length 4½ mm.

Stage IV. Head as in preceding stage. Body varying in colour from deep muddy brown to pale greenish brown with rather broad subdorsal and subspiracular creamy lines. Spines paler than the integument, thickly covered with brown hairs. At times the dorsal area is distinctly paler than the lateral area between the subdorsal line and the spiracle and generally the spiracular area is paler than the preceding lateral rows. Distinct tubercles are present along the anterior edge of the prothorax. Length 6 mm.

Stage V. Head black; apical two-thirds of front (clypeus), a streak across the clypeus, a semicircular area extending on cheeks from palpi around and above the eyes, and a vertical band from apex of cheeks to centre of same, white. Eyes white, situated on a black patch. Body deep purple-brown, the spines generally somewhat paler, arising from a white base; at times the supra-spiracular row is deeper in colour than the integument. Over the whole surface minute white spots are scattered, most numerous in the spiracular area, giving the appearance of a broad, pale, spiracular band; a pale subdorsal line, a faint supra-spiracular one and a very distinct subspiracular one; in late stages traces of orange at the bases of the subdorsal spines appear. Length 10 mm.

Stage VI. Head as in preceding stage, the extent of the lateral white area at base of cheeks rather variable. Body much as before with narrow, well-defined, pale yellow, subdorsal and broader subspiracular bands. Spines arising from a pale base and with white tip; hairs black-brown. Spiracle black; legs black; crotchets of prolegs arranged in a double row. Length 21 mm.

Pupa.—(Figs. 8–10). Ground colour pale creamy, but so thickly veined with brown and purplish as to appear superficially pale brown with whitish shadings. Shape much as in Scudder's figure of *P. tharos;* apex slightly truncate,

the lateral edges above the eyes pointed. Mesothorax crossed by an oblique lateral ridge terminating in a small tubercle representing the subdorsal spine of the larval stage; wing sheaths in the thoracic area bordered by a sharp irregular ridge. Transverse ridges cross the dorsal anterior portion of abdominal segments IV–VII, the spines of the larval stage being marked on them by small tubercles; remaining segments with dorsal and subdorsal rows of small warts, distinctly orange-tinged. Spiracles pale orange. In the intersegmental area traces of the subdorsal and subspiracular lines of the larva may be found, but these are not distinguishable on the general surface of the pupa. Wing sheaths with the brown veining forming more or less dark patches centrally near the antennal sheath and at the apex, adjoining abdominal segments I–III; an apical double row of raised white dots, about 1 mm. apart. Antennal sheath purplish with a row of raised white dots extending the entire length. Width of truncate apex 2½ mm. Length from apex to cremaster abdominally 10 mm. Width of mesothorax 3½ mm. Breadth at apex of wing cases 4½ mm.

EXPLANATION OF PLATE I.

Fig. 1.—*Phyciodes batesi* Reak, ♀.
Fig. 2.— " " " ♂.
Fig. 3.— " " " ♀, underside.
Fig. 4.— " " " ♂, "
Fig. 5.— " *tharos* Drury, ♂, "
Fig. 6.— " " " ♂, "
Fig. 7.— " " " ♀, "
Fig. 8.—Pupa of *Phyciodes batesi*, dorsal view.
Fig. 9.— " " " " lateral view.
Fig. 10.— " " " " ventral view.

TWO NEW SPECIES OF PLATYCAMPUS— (HYMENOPTERA TENTHREDINIDÆ).*

BY ALEX. D. MACGILLIVRAY,
University of Illinois, Urbana, Ill.

The genus Platycampus contains four species, *americanus* Marlatt from New York and New Hampshire and three western species, *smithi* Rohwer and *albostigmus* Rohwer from Colorado and *juniperi* Rohwer from New Mexico. To these are now added another species from New Mexico and one from British Columbia. The following table, in which the species of Rohwer are placed from his descriptions, will serve for their discrimination:—

a. Head and thorax wholly or in great part reddish-yellow
  b. Clypeus broadly shallowly emarginate, almost truncate.
    c. Head wholly or for the most part reddish-yellow
      d. Frontal crest strongly notched at middle; median fovea shallow, walls sloping; ocellar basin with rounded walls; antennal segments enlarged at distal end, third segment longest; stigma broad, not strongly tapering to distal end; colour reddish-yellow with the following parts white: clypeus, labrum, mandibles,

*Contributions from the Entomological Laboratories of the University of Illinois, No. 63. March, 1920

cheeks, and tegulæ in part; with the following parts black: first and second and part of third antennal segment above, eyes, ocelli, spot on lateral lobes, suture between mesonotum and mesoscutellum, metanotum, postscutellum, middle of basal plates, proximal part of metacoxæ, a spot above, and saw-guides; wings with veins pale brown, costa and stigma white.—Colorado.....*albostigmus* Rohwer.

dd. Frontal crest entire, not notched, large and prominent; median fovea broad and shallow; ocellar basin sharply limited, walls rounded; antennal segments enlarged at the distal end, the third and fourth segments subequal; stigma long, the caudal margin broadly convex; saw-guides retracted and concealed, distal end bluntly pointed; colour reddish-yellow with the sutures of the thorax in part and the central area of the mesosternum black.—Cloudcroft, New Mexico; H. L. Viereck, collector.....*vierecki*, n. sp.

cc. Head wholly black; median fovea shallow, traingular; ocellar basin almost wanting; antennæ with the third and fourth segments subequal; stigma broad, rounded on the caudal margin, broadest at proximal end; saw-guides broad, apex truncate, the lower margin oblique; colour reddish-yellow with the following parts black: the head, antennæ, spots on the lateral lobes of the mesonotum, the metanotum, the pectus, the legs, and saw-guides; labrum and four cephalic tibiæ and tarsi brownish.—New Mexico. —Bred from larvæ on Juniperus.....*juniperi* Rohwer.

bb. Clypeus deeply emarginate; stigma wholly or part yellowish hyaline; antennæ black above or wholly black.

c. Median fovea broad, comparatively deep, sides oblique; frontal crest strong, hardly notched; ocellar basin a rounded depression with rounded lateral walls, connecting with ocellar furrow; antennal segments three and four subequal; saw-guides pointed, the upper margin straight, the ventral margin slightly convex; colour reddish-yellow with the sutures of the thorax in part and the scutellum and the metathoracic pleuræ sometimes, black; the antennæ blackish or brown above; coloration extremely variable.—New Hampshire, New York.—Larva feeds upon poplar.....*americanus* Marlatt.

cc. Median fovea shallow, broad, walls sloping; frontal crest strong, slightly notched at middle; ocellar basin distinct, rather sharply pointed above; walls somewhat rounded; stigma large, broadest near the proximal end, tapering to the distal end; saw-guides broad, rounded on ventral margin, a brush of setæ at the distal end; colour reddish-yellow; clypeus, labrum, proximal portion of mandibles, posterior angles of pronotum and tegulæ somewhat pallid; antennæ above, small spot around ocelli, a small spot above each antenna, two spots on lateral lobes of mesonotum, sutures of caudal part of thorax, postscutellum, metanotum, middle of basal plates, proximal portion of posterior coxæ, caudal

portion of first and second terga, and proximal portion of saw-guides, black or brownish.—Colorado..... *smithi* Rohwer.

aa. Head and thorax, except pleuræ, glossy black; frontal crest moderately prominent, deeply interrupted by an extension of the elongate suboval median fovea; ocellar basin distinct with rounded walls extending around median ocellus; antennæ with third and fourth segments subequal; head and thorax finely setaceous; saw-guides straight above, pointed at distal end above, and ventral margin convex and oblique at distal end; colour reddish-yellow with head, including clypeus, labrum and antennæ, the pronotum except the lateral portion, the mesothorax and metathorax except the lateral aspects; the pectus, and the tips of the tarsi black; the proximal portion of the stigma and the longitudinal veins extending through the disc of the wing blackish; the male differs in having the antennæ reddish-yellow and the frontal crest obsolete and the sides of the median fovea continuous with the sides of the ocellar basin; the proximal end of the ventral side of the third antennal segment provided with a blunt, rounded projection.—Victoria, British Columbia, bred by W. Downes from larvæ on lombardy poplar.—Type deposited in National Collection of Insects, Ottawa, from which it was received..... *victoria*, n. sp.

NOTES ON COCCIDÆ VI. (HEMIPTERA).*

BY G. F. FERRIS,
Stanford University, Calif.

Genus Porococcus Ckll.

Coccidæ referable to the subfamily Dactylopiinæ (of the Fernald Catalogue) and belonging to the *Pseudococcus* group, that is, with at least the posterior pair of dorsal ostioles present. Adult female with the legs and antennæ present, the former without a tooth on the claw, the latter 6-7-segmented; without cerarii of the usual type but with the last three or four abdominal segments bearing at each lateral margin a chitinized area which may be continuous with a chitinized area extending across the dorsum of the segment and is beset with stout, conical spines; trilocular pores numerous and very conspicuous; anal ring with six long setæ, well developed and heavily chitinized, not borne at the inner end of an invagination.

Adult female enclosed within a test of hard, black secretion which in texture much resembles that of the genus *Tachardia*.

Type of the genus, *Porococcus tinctorius* Ckll

Notes.—In the Fernald Catalogue this genus is placed near *Ericoccus* but it is distinctly a pseudococcine form. At present the genus contains but the type species and another, *P. pergandeii* Ckll., both of which occur on mistletoe in Mexico.

*Continued from Canadian Entomologist, Vol. LII, p. 32.

Porococcus tinctorius Ckll.

Fig. 12.

Habit.—Adult female entirely enclosed within a test of hard, black secretion which is roughly spherical in form.

Morphological characteristics.—Length (flattened on slide) 2.5 mm. In form the body (flattened on the slide) is almost circular except for the fact that the last four abdominal segments, together being much narrower than the remainder of the body, form a sort of tail (Fig. A). The terminal segment bears the rather large and heavily chitinized anal ring, which is flanked on each side by a large, chitinized area bearing two or three conical spines and a few

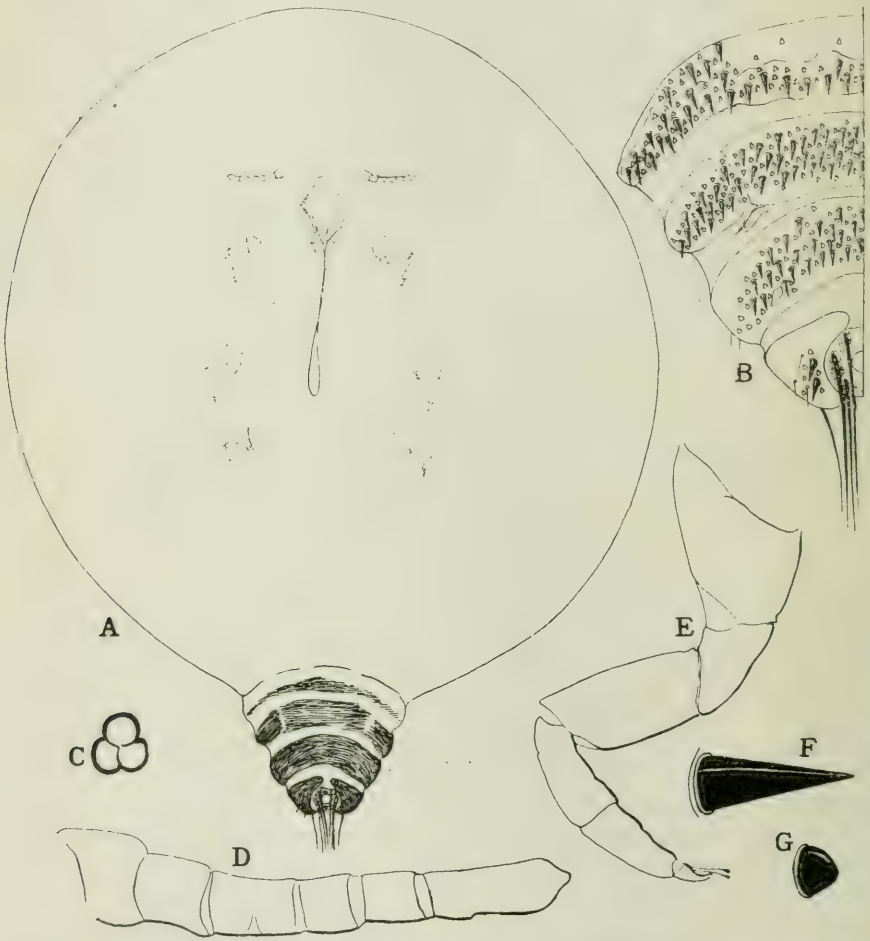

Fig. 12.—*Porococcus tinctorius* Ckll. A, general aspect of body; B, dorsal aspect of last four abdominal segments; C, trilocular pore; D, antenna; E, leg; F, type of spine occurring on dorsum of last four abdominal segments; G, type of spine on the dorsum anterior to the last four abdominal segments.

pores, these areas nearly meeting at the median line of the dorsum and extending slightly on to the ventral side. The next three segments each bear a transverse, heavily chitinized area beset with numerous conical spines of the type shown in Fig. F and pores (Fig. B). Over the remainder of the body the spines are rather few and are much smaller, short and tubercle like (Fig. G). Tri-

locular pores, of the type shown in Fig. C are very numerous and unusually large and conspicuous. The antennæ (Fig. D) are relatively quite small but are well developed and show six or seven segments. The legs (Fig. E) are likewise relatively quite small, and the coxæ of the posterior pair show many small pores.

The first stage larva likewise bears numerous large, trilocular pores and a few small, conical spines. The anal ring is large and cellular and bears six setæ. The anal lobes each bear a single seta which is about as long as those of the anal ring. There are no indications of cerarii.

Material examined.—Two slides received from Professor Cockerell and labeled merely as "types" of this species and a slide mount of a single individual received from Mr. E. E. Green and said to be from the type material of the species. It is from the last that the accompanying figures were made.

There has evidently been some mixing of material in connection with this species for another slide received from Professor Cockerell and likewise labeled as a "type" of this species represents some Lecaniine form.

Through the kindness of Professor Cockerell I have had the privilege of examining a slide labeled as a "type" of *P. pergandeii*. The two species are very similar but I am not prepared to say whether or not they are identical.

Genus Cissococcus Ckll.

Brain[1] has considered it necessary to erect a new subfamily, the *Cissococcinæ*, for this genus. As I have previously pointed out in this series of notes this genus is a Lecaniine form showing certain affinities with *Ceroplastes*. The statement that the anal plates are four in number is erroneous, the supposed outer pair being nothing more than the chinitized area upon which the anal plates are borne. The arrangement is strictly the same as that seen in *Ceroplastes*, and a comparison with the latter genus will dispel any thought of the necessity of a new subfamily for *Cissococcus*.

Genus Howardia Berlese and Leonardi.

1896. Berlese and Leonardi, Rev. Patologia Veg., 4: 347.
1896. Cockerell, Bull. Bot. Dept. Jamacia, 3: 256.
1903. Fernald, Cat. Coccidæ, 226.
1915. Paoli, Redia, 11: 255.

There appears to be some confusion concerning the type of this genus. Under the original description there were included three species, *Chionaspis biclavis* Comst., *C. citri* Comst. and a species there described as new under the name of *Howardia elegans*, this last being a synonym of *Diaspis zamiæ* Morgan. No type was designated. Cockerell (1896) in a paper which seems to have been omitted by the Fernald Catalogue, designates as type, *Chionaspis biclavis* Comst. This paper appears to have been overlooked by Paoli (1915) who states that *H. elegans* (= *zamiæ*) is the type of the genus and he names a new genus, *Megalodiaspis*, for *Chionaspis biclavis*.

It is evident that the type fixation made by Cockerell must stand, and that *Megalodiaspis* must be placed as a synonym of *Howardia*.

Genus Anoplaspis Leonardi.

1898. Leonardi, Rev. Patologia Veg., 6: 207.

[1]Brain, C. K. Coccidæ of South Africa II. In Bull. Ent. Res. 9: 109, (1918).

1900. Leonardi, Ibid., 8: 344.

1903. Fernald, Catalogue Coccidæ, 299.

This genus was named by Leonardi in 1898 and its type was definitely stated to be *Mytilaspis metrosideri* Maskell. Later (1900) Leonardi stated that he found *metrosideri* to be a species of *Aspidiotus* and he transferred the generic name *Anoplaspis* to the species earlier named by Cockerell as *Aspidiotus bambusarum*, designating this as the type. This procedure is followed in the Fernald Catalogue and *Anoplaspis* is placed as a synonym of *Odonaspis* in which the species *bambusarum* is included. The species *Mytilaspis metrosideri* Maskell is placed under *Lepidosaphes* in the catalogue and no reference is given under it to Leonardi's first paper.

It is obvious that the first type fixation must stand and that the status of the genus *Anoplaspis* depends upon that of *Mytilaspis metrosideri*, its type species.

A revision of the genera of Diaspinæ must soon come for the group is falling into confusion because of the many genera and subgenera that have been named usually upon characters of no particular significance. Many of these names, however, must be used, and it is desirable that such points as those discussed above be straightened out.

Synonymy of Some Species.

Targionia yuccarum Ckll.

1898. *Aspidiotus yuccarum* Ckll., Ann. Mag. Nat. Hist., (7), 2: 25.

1900. *Chrysomphalus* (*Melanaspis*) *tonilensis* Ckll., Ibid., (7), 10: 470.

1919. *Targionia covilleæ* (Ferris), Contrib. Knowl. Coccidæ Sw. U. S., Stanford Univ. Publ., 67–8.

Mr. Morrison has called my attention to the fact that my *Targionia covilleæ* is identical with *T. yuccarum* (Ckll.), and has sent me a specimen of the latter species. There is no doubt that the two are the same. Also, through the kindness of Professor Cockerell, I have been enabled to examine a slide of *Chrysomphalus tonilensis* Ckll. from the type material, and this too proves to be the same. The species is a true *Targionia* as I have pointed out in the description of my *T. covilleæ*.

Aspidiotus herculeanus Doane and Hadden.

1909. *Aspidiotus herculeanus* Doane and Hadden, Can. Ent., 41: 298.

1918. *Aspidiotus subsimilis* var. *anonæ* Houser, Ann. Ent. Soc. Am., 11 m.: 163; pl. 18, f. 1.

The figure given by Houser indicates clearly that his *A. subsimilis* var. *anonæ* is identical with *A. herculeanus*, and Mr. Morrison, to whose attention I have called this and who has examined specimens, agrees that this is the case. I have had the privilege of examining a "type" slide of *A. subsimilis* Ckll., and unless intergrading forms exist there is no reason for placing *herculeanus* as a "variety" of this species.

Pseudodiaspis yuccæ Ckll.

1896. *Aspidiotus yuccæ* Ckll., Psyche, 7; Suppl. 1, p. 20.

1898. *Aspidiotus yuccæ* var. *neomexicana* Ckll., Ann. Mag. Nat. Hist., (7), 2 m.: 25.

1899. *Xerophilaspis parkinsoniæ* Ckll., Ariz. Exper. Sta., Bull. 32 m.: 282.

1899. *Diaspis celtidis* Ckll., Can. Ent., 31 m.: 106.

1919. *Pseudodiaspis parkinsoniæ* (Ckll.), Ferris, Contrib. Knowl. Coccidæ Sw. U. S., Stanford Univ. Publ., 56; Fig. 30.

Through the kindness of Professor Cockerell I have been enabled to examine "type" slides of all the above species. There is not much room for question that they are the same. In the specimens of *yuccæ* the lobes are shorter than in the others, but otherwise there is no difference, and I suspect that, as not infrequently occurs, the lobes in these specimens are worn or broken off.

Lepidosaphes hawaiiensis Maskell.

1894. *Mytilaspis flava* var. *hawaiiensis* Mask., N. Z. Trans., 27: 47.

1914. *Lepidosaphes erythrinæ* Rutherford, Bull. Ent. Res., 5: 264.

1916. *Lepidosaphes moorsi* Doane and Ferris, Bull. Ent. Res., 6: 401; f. 3.

1919. *Howardia moorsi* (D. & F.), Brain, Bull. Ent. Res., 9: 220; pl. 13, f. 132.

Mr. E. R. Sasscer has called my attention to the fact that *L. moorsi* appears to be identical with Maskell's *L. flava* var. *hawaiiensis*, and after the examination of a photograph of the pygidium of the latter I am entirely disposed to agree. I have at hand some specimens from Ceylon which agree with the description of *L. erythrinæ*, and there is not much doubt that this too is the same. It is evidently a widely distributed tropical and subtropical species.

Brain has recently referred the species to *Howardia*, but it is most certainly not congeneric with *H. biclavis*. For that matter it is hardly a *Lepidosaphes* but it may well remain in the latter genus until revisional studies have been made. There is no evidence that it has anything to do with *L. flava*.

DESCRIPTIONS OF A FEW NEW DIPTERA.

BY NATHAN BANKS.
Museum of Comparative Zoology, Cambridge, Mass.

The types of the following new species are in the Museum of Comparative Zoology.

Euparyphus pretiosa, sp. nov.

Differs from *crotchi* as follows: Legs wholly yellow, the median black stripe from vertex mark to antennæ does not go below antennæ, the submedian pair of stripes on thorax extend a little beyond the suture, are broader posteriorly and slightly approximate there, the hind part of lateral stripe is longer, the upper pleural stripe is longer and has a forward extension, the spots on third and fourth abdominal segments are much larger and almost meet in the middle, venter wholly pale (mostly dark in *crotchi*). The scutellum is yellow, broad, and the spines are far apart as in *crotchi;* the discal cell is clearly outlined; eyes pubescent.

Length 7.5 mm.

Vancouver, one female.

E. septemmaculata Adams agrees with *E. crotchi.*

Nemotelus melanderi, sp. nov.

Black, polished, without pale marks, in some a faint lateral margin to thorax, the extreme tips of femora, bases of tibiæ and tarsi pale; halters pale,

the thorax with faint white pubescence. Facial projection extremely short, about as in Melander's figure of *N. bruesi*, but not blunt at tip, and the antennæ plainly at base of the projection; discal cell with upper side distinct.

In Melander's table it runs to *N. carbonarius*, which has a very much larger facial projection.

Length 3 mm.

From Chesapeake Beach, Ind., 9 July, also Bayville, N.Y., and Nahant, Mass., (Agassiz). Evidently a costal species.

Stenopogon (Scleropogon) uhleri, sp. nov.

Clothed with grayish pubescence and white hair and bristles; antennæ black, wings hyaline, abdomen obscure, tips of segments paler, legs dark, some reddish on front and middle femora. Wings with first and fourth posterior cells closed and petiolate; hypopleura with white hairs, sternopleura with short fine hair. Male ventral plate divided at tip and the lobes divergent; the intermediate appendages have the inner black hooks as in *S. similis*, but when seen from the side do not have a black process at the lower corner, seen in *S. similis*.

Length 2.3 mm.

From the hills west of Denver, 18 Aug., (P. R. Uhler). Differs from *S. similis* and *S. pumilus*, which are of the same general appearance, by having the lobes of the ventral plate longer and divergent.

Atomosia antennata, sp. nov.

Head black, thorax metallic bluish, abdomen metallic greenish, venter brown, legs with the femora pale reddish or yellowish, tibia dark brown, tarsi lighter brown, palpi pale, antennæ dark, second joint yellowish, wings nearly hyaline, pleura with two or three patches of silvery pubescence. Face clothed with whitish pubescence and white hair, thorax and abdomen with very short pale hair, legs with longer white hair. Ocellar tubercle with two bristles; first joint of antenna a little more than twice as long as the second, which is rather shorter than usual, third not twice as long as first and second together; end of discal cell curves out a little from the end of the fourth posterior cell.

Length 5 mm.

From Douglas, Arizona, August, (L. H. Snow). Distinct from all our other species by colour of second antennal joint, as well as by the metallic colour of thorax and abdomen.

Nicocles utahensis, n. sp.

♀ Structurally similar to *N. æmulator* Lw., the bristles on the scutellum and thorax as in that species. It is, however, black in colour with white hair and pile, instead of the brown hair and somewhat yellowish pile of *N. æmulator*. The dorsum of thorax beside the middle geminate dark stripe has also short lateral dark stripe in front; the legs are entirely black (without the red seen in *N. æmulator*); the abdomen is very similar to the female of that species, with pollinose white spots, but those on the fifth segment are triangular and smaller than in *N. æmulator*. The wings are marked on the same plan, but the marks follow the longitudinal veins, and there is no tendency to form dark clouds

across middle and tip as in the California species. In both wings the small cross vein is double, and situate at middle of discal cell (in *N. æmulator* nearer to tip of cell.

From Eureka, Utah, 31 May, (Tom Spalding), from Mr. Hagan.

Laphria varipes, n. sp.

Closely similar to *L. ruficauda* Will.; it differs in the antennæ being black, and the legs have the apical fourth of the femora and the tarsi wholly black; the abdomen is dull black (instead of shining blue black), the last three segments red as in *L. ruficauda;* the humeri and scutellum are also reddish; the wings as in *L. ruficauda.*

Length 2.3 mm.

From Cuba (Poey).

Asilus persimilis, n. sp.

Similar to *A. truquii* in the male genitalia, which have a long, slender tooth on the upper forceps, which bends inward and downward; the main part of the forceps, however, bends downward, instead of upward as in *A. truquii.* It differs from that species in having a large facial gibbosity that almost reaches to the antennæ. The mystax is black above and below, with yellowish hair on the middle; the wings are faintly reddish from near the middle, especially near costa. The body is black, with black hair and bristles; the abdomen above rather more grayish, and the hind border of each segment in certain lights paler gray; the genitalia black, black haired, and the lower forceps rather heavily black bristled. Legs black, apical part of all femora and almost basal half of all the tibiæ reddish; tarsi black.

Length 16 mm.

From California (Loew coll.).

Asilus sackeni, n. sp.

In size and general appearance similar to *A. mesæ* Tucker; about 8 to 10 mm. long. Differs in the longer appendages to the male, and in the black hair in the mystax.

Black; mystax largely black, lower part white; the facial gibbosity not higher, but longer than in *A. mesæ;* occipital orbital bristles black; pleuræ more black, with faint gray pollen; thorax and the scutellum with black bristles. Abdomen above brown (not gray), with gray borders; genitalia reddish, the superior forceps plainly more slender than in *A. mesæ.* Legs black, the tibiæ more or less brown, especially within, bristles of legs all black. The antennæ has the arista more differentiated than in *A. mesæ,* but not as strongly separated as in most species.

From Webber Lake, California, 22 July (O. Sacken), and also Oregon (O. Sacken).

The much longer, superior forceps and largely black mystax and darker colour generally will separate it from *A. mesæ.*

NOTES ON THE WINTER COLEOPTERA OF WESTERN AND SOUTHERN FLORIDA, WITH DESCRIPTIONS OF NEW SPECIES.

BY W. S. BLATCHLEY,
Indianapolis, Ind.

(Continued from p. 46).

Ptinus tuberculatus, sp. nov.

Oblong-oval. Head and thorax dark chestnut-brown; elytra dark reddish-brown; antennæ and legs paler brown, densely clothed with prostrate yellowish hairs; under surface reddish-brown, sparsely pubescent with yellowish hairs. Antennæ reaching middle of elytra, second joint one-half the length of fourth; fifth to eleventh subequal, each slightly longer than fourth. Head finely granulate-punctate. Thorax subcylindrical, but slightly wider than head, densely and rather coarsely granulate-punctate and bearing four large conical tubercles arranged in a median cross-row, two above and one each side, each of these bearing a tuft of short, erect yellowish hairs. Elytra oblong, rather strongly convex or ventricose, their striæ feebly impressed, each composed of a row of coarse, close-set punctures, which are much wider than the intervals, each puncture bearing a long inclined yellowish hair. First joint of hind tarsi slightly longer than the next two united. Abdomen very finely and sparsely punctate. Length 3.2 mm.

A single specimen, probably a female, was taken while beating along a blazed roadway in a dense hammock at Cape Sable, Feb. 23. It is different from any species described by Fall, and is unknown to him. The head and thorax are distinctly darker than elytra, and the tuberculate thorax reminds one of the spiked collars often worn by an aristocratic Boston bull terrier.

Heteracthes sablensis, sp. nov.

Elongate, slender, subcylindrical. Head, thorax, under surface and all the femora and tibiæ dark chestnut-brown; antennæ, elytra and tarsi reddish-brown, the elytra each with a large, elongate-oval, yellow spot at basal third and the apical fifth wholly yellow. Antennæ, as usual with males of the genus, with joints 1–6 much thicker than the others, fourth, two-thirds the length of either third or fifth, the minute second joint obconical. Thorax cylindrical, twice as long as broad, feebly constricted near base, its disk with a low median tubercle, surface minutely granulate-rugose and pubescent with very fine, appressed hairs. Elytra three times as long as thorax, one-third wider at base, their tips subtruncate, the outer apical angle produced as a short spine; surface with scattered small tubercles, thickly and very finely punctate, minutely pubescent. Under surface very finely punctate and pubescent. Length 8.5 mm.

Described from one male swept from low herbs just back of the beach at Cape Sable, Feb. 21. Very distinct from our other species in colour and in the truncate, feebly spined tips of elytra.

Euderces reichei Lec. A half dozen specimens of this small Cerambycid were beaten March 21 from the flowers of a dogwood in Skinner's hammock near Dunedin. The first record for Florida, it being known heretofore only from Indiana, Illinois and Texas.

Liopus floridanus Ham. Two specimens of this small, dull-coloured Lamiinid were swept from ferns in a dense hammock near Dunedin, March 10–March 24. Described[11] from Biscayne Bay and not recorded elsewhere.

Lepturges signatus Lec. A single specimen taken at light at Dunedin, June 15. Schwarz records it from Enterprise as "rare."

Spalacopsis filum Chev. This was a common species on dead twigs in the hammocks at Cape Sable and Key West. When stretched out on a twig with their long antennæ at full length in front of them, their gray colour is so similar to that of the bark that they are almost invisible. Although three or four species of this genus have been described or listed from southern Florida, it is very doubtful if more than the one above named really exists in that region.

Exema neglecta, sp. nov.

Oblong, robust. Black, opaque; antennæ, palpi, front and middle legs in great part, and some spots on head, dull clay yellow; face and front half of thorax of male wholly of the same hue. Head finely, not closely ocellate-punctate. Thorax finely and irregularly punctate, the middle of disk strongly elevated, tuberculate and with a shallow median sulcus, the sides and posterior declivity of the elevation strigose-punctate. Tegmina oblong, each with a subsutural row of three or four blunt tubercles and several other scattered ones, the intervals between them coarsely, more or less confluently punctate. Pygidium with a narrow, entire median carina between two shorter, broader ones, the intervals coarsely punctate. Hind femora and under surface coarsely punctate. Length male 2.7; female 3 mm.

Common throughout Florida on huckleberry and other low shrubs throughout the winter months. This is the species known in most cabinets as *Exema conspersa* Mann., and has been distributed by me under that name. On taking the true *conspersa*, which is very scarce in Florida, I sent specimens of both to the U.S. National Museum, and H. S. Barber replied that the larger one above described was in the museum collection under the name *conspersa* var., some specimens also having been labeled *E. dispar* Lec. On a recent visit to Cambridge, I found that the smaller form was the one there recognized as *E. conspersa*, and as the larger and more common one appears to have no name, I have given it that of *neglecta*.

Exema conspersa Mannerheim. This is a much smaller (1.8–2 mm.), more subquadrate species than *neglecta* and usually has both thorax and elytra distinctly maculate with brownish-yellow. The thorax is without strigæ, its punctures more numerous, much deeper. The elytra are more rugose with crests of tubercles longer, more narrow, and the punctures much smaller. A single specimen is in the National Museum from Enterprise, Fla. About Dunedin I have taken it on several occasions by sweeping weeds about the margins of low, moist, cultivated tracts. It ranges from Florida to California and Mexico.

As pointed out to me by Mr. Barber (Ms.) my *Chlamys nodulosa*[12] is probably a synonym of *Exema gibber* Fabr. It was originally described from

11. Trans. Amer. Ent. Soc., XXIII, 1896, 125.
12. Can. Ent., XLV, 1913, 22.

Charleston, S. Car., and occurs in both bronzed and opaque black forms. The description of Fabricius mentions the black form only.

Metachroma terminale Horn. Frequent at both Cape Sable and Key West on the foliage of shrubs in hammocks. The elytra vary much in colour, being sometimes wholly dull yellow, again uniform pitchy black without the terminal pale spot on which the specific name was based.

Metachroma testacea, sp. nov.

Form short, robust. Head and thorax reddish-brown, remainder of body a uniform testaceous. Head coarsely, shallowly and irregularly punctate. Thorax semi-elliptical, much wider and with sides less declivent than in *M. pellucidum;* sides and hind angles broadly rounded, disk finely, rather closely, evenly and sharply punctate. Elytra one-third longer than wide; striæ near suture distinctly impressed, those on sides scarcely so, all with distinct rows of round punctures separated by two-thirds their own diameter. Abdomen rather finely and very sparsely punctate. Length 2.3–2.5 mm.

A small species of the form and size of *M. pellucidum* Crotch, but much duller in colour, with different form of thorax and with elytral striæ all entire and punctate throughout their length. It was taken in some numbers by beating and sweeping at Key West, March 1–3. Specimens were submitted to Mr. Fall, who states that he has it unnamed in his collection and considers it an undescribed form.

Trirhabda virgata Lec. One specimen taken at light at Dunedin, July 1, was sent to me by my son. No definite Florida record can be found. Horn states that it "Occurs on the Atlantic coast from Massachusetts to Florida, from which point to Texas it is replaced by *brevicollis.*" It is frequent throughout Indiana.

Galerucella bivittata, sp. nov.

Elongate-oblong. Dull clay yellow; antennæ and occiput entirely deep black; labrum, mesosterna, sides of abdomen and tarsi piceous black; thorax with a median stripe and a spot each side black; elytra each with a broad submarginal and a narrow subsutural stripe, the two broadly united at tip, deep black. Thorax transversely elliptical, about one-half wider than long, angles all rounded, disk concave each side of the median line, very finely and sparsely punctate, each puncture bearing a very short, fine, appressed hair. Elytra elongate-oval, margins not explanate, disk densely and coarsely punctate, each puncture bearing a silken yellowish semi-prostrate hair; middle coxæ contiguous. Under surface minutely punctate, very finely pubescent. Length 4.5 mm.

Two specimens swept from huckleberry blossoms near Dunedin, March 21. The wholly black antennæ and occiput and bivittate elytra distinguish it from all other described species.

Longitarsus subcylindricus, sp. nov.

Elongate-oval or subcylindrical. Dull reddish-brown; basal half of antennæ, under surface and legs paler reddish-brown; apical half of antennæ fuscous. Head smooth, occiput strongly convex. Second, third and fourth joints of antennæ subequal in length, two-thirds the length of fifth. Thorax subcylindrical, scarcely longer than wide, disk convex, sides strongly declivent,

their margins feebly curved, surface finely and very shallowly punctate. Elytra conjointly elongate-oval, widest at middle, three times as long as wide, not wider at base than thorax, humeri and umbones wholly absent, disk with fine shallow substriate, close-set punctures. Abdomen smooth. Length 1.8 mm.

Very distinct in its elongate subcylindrical form, being widest at middle of elytra and tapering gradually but very feebly both ways. The surface is not alutaceous but appears subopaque, due to the numerous shallow punctures. It is probably apterous. Known from a single specimen taken by beating in Skinner's Hammock near Dunedin, March 27. Not in either the Leconte or Horn collections, and unknown to Fall.

Coptocycla repudiata Suffr. Twenty or more specimens of this tortoise beetle were taken at Cape Sable from among the bases of the tufts of a coarse grass growing on the open prairie. It was described from Cuba and is recorded by Barber[13] from Haw Creek, Crescent City and Cocoanut Grove, Fla.

Metriona ormondensis, sp. nov.

Broadly ovate or subcylindrical. Above dull yellow; elytra with a broad, purplish-red stripe extending obliquely from humerus to middle of lateral declivity of each strongly convex elytral disk, thence curving outward to margin near apical fourth; thorax and broadly flattened crescentic middle third of each elytral margin translucent yellow; eyes and under surface deep black; legs and joints 1–8 of antennæ pale yellow; joints 9–11 of antennæ fuscous. Thorax transversely elliptical, nearly twice as wide as long, its front margin very broadly curved, front angles narrowly rounded, surface reticulate and with a few scattered punctures near middle and at base. Elytra strongly elevated at middle with sides of elevation almost perpendicular; margins strongly explanate; disk with rows of round, shallow punctures, separated by about their own diameters, those on basal third and near humeri somewhat confused. Abdominal segments finely and sparsely punctate. Length 6 mm.; breadth 5 mm.

Described from two specimens taken from wild morning-glory at Ormond, Fla., April 13, 1913. Much larger than *M. purpurata* (Boh.), with flattened margins of elytra much wider, thorax wider and proportionally shorter and colour very distinctive. It is probably the same as the specimen referred to by Barber (loc. cit., p. 125) as being in the Schæffer collection from Florida. Barber considered that to be only a geographic race of *purpurata*.

Chelymorpha geniculata Boh. This large Chrysomelid was common and mating along the beach at Long Key, Feb. 27 on the foliage of the creeping goat's-foot morning-glory, *Ipomœa pes-caprœ* Sweet. It was taken on the same vine at Cape Sable, Key West and Dunedin, and I believe that to be its true, perhaps only, food plant in Florida. In my opinion this species should be placed as distinct from our northern *C. cassidea* Fabr. (*argus* Herbst.). In addition to the very different hue and much smaller black spots it is always narrower and more oblong in form.

Branchus floridanus Lec. A single specimen of this large, oval, gray, scaly Tenebrionid was found lying on its back in a roadway, but alive and kicking, at Key West. It was described[14] from Florida without definite locality and Schwarz lists it as "On Atlantic seashore, very rare."

13. Proc. Entom. Soc. Wash., XVIII, 1916, 123.
14. Smiths. Misc. Coll. No. 167, 1866, 111.

Polypleurus geminatus Sol. This is also apparently a scarce species. It has not been recorded from Florida. One specimen was taken near Lakeland, Feb. 15, beneath a large pine chip, and another at Dunedin, Dec. 25,by beating Spanish moss. Horn in his Revision of the family says that it occurs in the "Southeastern United States." The closely allied *P. perforatus* Germ., is listed by Schwarz from Enterprise as "very rare." The third and only other known species, *P. nitidus* Lec., is common beneath bark and logs about Dunedin and elsewhere in southern Florida throughout the winter.

Blapstinus alutaceus Casey. Three specimens of this scarce species were taken, one at Cape Sable, by beating dead branches, the others at Key West by sifting dead leaves. It was previously known only from Key West and Buck Key, Fla., and Texas. First described[15] by Leconte as *B. opacus*, which name was preoccupied.

Acanthinus trifasciatus Fabr. A single specimen of this West Indian species was taken from beneath a chunk on the beach at Cape Sable. It is also known from Key West.

Pomphopœa femoralis Lec. Two specimens of this large and brilliant Meloid have been in my collection unnamed since January, 1913, when they were taken at light at Dunedin. I supposed them to be some introduced tropical form which I could not place by the literature available. They were finally named for me by A. J. Mutchler of the American Museum of Natural History. Leconte described[16] the species from Louisiana, as *Lytta femoralis*, but it was afterwards erroneously placed as a synonym of *P. polita* Say by Horn.[17] The head and thorax are a shining bronze, while the elytra are of a brilliant coppery hue.

DIVISION OF FOREIGN INSECT PESTS SUPPRESSION.

In an endeavour to prevent the further spread of the apple sucker (*Psyllia mali* Schmid) by artificial means, a quarantine has been placed on the infested district in the vicinity of Wolfville, N.S. No apple stock, including seedlings, scions, buds or grafts may be removed from the quarantined area unless it is accompanied by a certificate of inspection.

The Brown Tail Moth work in New Brunswick was closed down in the middle of January. No nests have been found during the past two years. Only four men were employed this season, and the greater portion of the territory was scouted with the aid of a car. In Nova Scotia 267 Brown Tail nests were collected up to January 31st; this is a considerable reduction as compared with previous years. The brown tail is still continuing to breed in this Province, and local infestations are uncovered from time to time. The majority of scouts were discharged on January 31st.

15. Proc. Amer. Phil. Soc., XVII, 1878, 420.
16. Proc. Acad. Nat. Sci. Phil., VI, 1853, 336.
17. Proc. Amer. Phil. Soc., XIII, 1873, 116.

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POPULAR AND PRACTICAL ENTOMOLOGY.

Familiar Haunts.

BY FRANCIS J. A. MORRIS,
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Finding myself in Port Hope on the last day of June, 1918, I took occasion and my hobby by the forelock, and, in the company of my fellow-collector of old days, headed north for some woods just west of our favorite "Rocky Mountains." Here lies as pretty a tract as can be found in all Northumberland, with extensive bush to west and north and embracing roughly a square mile of ground. It forms a kind of table land of middle elevation between the Port Hope plains and the long wooded ridge that stands out against the skyline as you look north from the campus of Trinity College School.

Deserting our usual route for a somewhat more westerly course, we held up the Bewdley gravel-road past the first line north of Dale; here a rough road, closed off by a gate, runs east to a gravel pit. Just beyond this we turned north to examine a grove of mixed hardwood and pine where the axe had been busy. In spite of its being bright and hot, we could find nothing at work about the cord wood and stumps, nor even about a few recently felled maples lying crushed and shattered as saw or axe had left them.

It was hot work and dry, stumbling about the clearing over rough, hard-baked ground, and even my hobby—old war-horse that it was—showed signs of flagging. My companion dismounted altogether and soon found a ready-made cozy corner in the grass beneath a shady evergreen. Just before giving up the search myself, and already at the point of indifference, I happened to spy a trunk of white pine lying in the very centre of the clearing, where the sun poured down relentless rays.

As I approached it I saw a small, dark longicorn settle on the butt; this proved to be *Acmaeops proteus*, a beetle sufficiently uncommon in our neighborhood to warrant capture. Then while skirting the trunk, I noticed near the middle and on the upper side, clinging to the rough bark, a blackish longicorn with yellow marks on the elytra; at first glance I took it for *Clytanthus ruricola* and wondered what it was doing on pine, for I have never captured this insect except on foliage or in blossoms, where it is a voracious pollen-feeder. A second look showed me at once that the beetle was new to me; it was much shorter than *C. ruricola* and had a peculiarly truncate appearance. Moreover, the marks and lines of yellow pubescence on the wing-covers formed a different pattern from that of *Clytanthus*, being unlike both in shape and in disposition. Both insects are nearly black, "piceous" rather than jet; the antennæ in both are fairly short, somewhat darker in the stranger, whose thorax, also, is shorter and less elevated; the forward margin of the thorax in both is fringed with

yellow, but in the stranger the hind margin is also yellow; both have a yellow scutellum and a small patch of yellow at the base of each wing-cover; but the familiar long "L"-shaped mark of yellow behind this in *Clytanthus ruricola* is replaced in the stranger by a simple diagonal line slightly curved, and behind this is a transverse band of yellow continued across the sutural line over both elytra. The thighs of both insects are clavate, but in *C. ruricola*, only, are the hind thighs and tibiæ elongate; in the stranger they are even shorter than in *Xylotrechus* and more strongly clavate. The insect has been identified as *Clytus marginicollis* and is, I believe, a great rarity in Ontario; at any rate, it is a new species and a new genus in my collection, filling an important gap in the group of *Clytini*.

It was quite enough for me that I had been collecting Longicorns for 15 years and had never seen this insect before. There lay my friend, inert as the weariest of mere wayfarers without an object could possibly be on a sizzling hot day; but my capture filled me at once brimful of activity and fervour. I spent a good half hour peering about that pine trunk and its limbs in the hope of another capture, and even when we decided to move on, I was still straining at the leash, eager to beat the next cover for game.

Just west of Hume's old home-farm is a sloping hillside covered with small trees and intersected by streams of cress-mantled spring water. At one of these I stooped to drink, for a long draught is worth far more to the pedestrian on a hot day than solid food of any kind. While thus refreshing myself I observed on the further bank a recent windfall of basswood; "windfall," I call it, but it might almost have been called a "water-fall;" for its roots had been undermined by a freshet, and a sudden flaw of wind taking it by surprise had overturned it. It was while struggling up the further bank, with one eye glued on the basswood, that I caught sight of a specimen of *Neoclytus erythrocephalus* running along a limb on the off-side of the fallen tree. As soon as I got to the top of the bank I hurried round the head of the tree to where I had seen the insect. There it was again! but unfortunately hurrying down towards the axil of a large limb impossible of approach owing to the thicket of grapevine into whose midst the tree had crashed. However, I kept the insect in view, and presently to my relief it faced about and came up towards the smaller branches at the top of the bank. And here after a little anxious stalking, I made my capture. Next moment I saw the dead image of it, very much alive, hurrying along the limb again; had it escaped from the cyanide jar? No, there it was safe in the glass bottle. Again I stalked my quarry, and again I made my capture; and presently, behold a third, running along the trunk. Where the insects came from I could not discover, but it seemed certain that they arrived by aeroplane and became visible only on alighting. Some time after, I spied a fourth, but it managed to elude the eager clutch of my fingers, as it had the jaws of my forceps and the yawning gape of my net; no sooner did it take to flight than it vanished into thin air.

In its descent the tree had broken some shoots of sumach at the top of the bank; close to these, but nearly under the basswood and in neutral territory on the ground, I captured a beautifully marked grey-brown Lamiinid which proved to be *Lepturges symmetricus;* some days later, my friend took a second specimen

on the basswood, so perhaps the latter has the better claim to have bred out this insect; on the broken sumach, I captured a specimen of *Leptnrges querci*, and on a bruised branch of the basswood, just before leaving, I took *Eupogonius subarmatus* and *Leptostylus macula;* this last I have taken 3 times on basswood and rather more often on sumach; it is very fond of attaching itself to a branch —usually of small girth—that has been bruised or broken, and there I presume it oviposits. A few years ago my friend captured 8 or 10 of these insects and 3 or 4of *Goes oculatus* in a few sumachs on the south edge of what we know locally as the North Wood. The insects were nearly all on branches partly killed; and the whole colony of sumachs where they were taken is now dead, I believe almost entirely as the result of Lamiinid larvæ; large numbers of *Hyperplatys aspersus* and *Liopus alpha* riddling the small branches, while *Leptostylus* and *Goes* tunnel the thicker stems. The life of a sumach thicket, all observers will readily admit, is remarkably short, shorter than that of an elder thicket, and in nearly all cases the destruction is caused by insect borers. These light, brittle woods with a pithy core being, it would seem, peculiarly prone. In the particular section I am speaking of, equally deadly has been the work of the weevil, *Cryptorhynchus lapathi*, among the willows bordering the small streams.

We were now at the edge of our chosen trysting place, one of the prettiest spots in all these northward tramps of ours. The time was ripe for lunch and a rest on soft mossy turf, within sight and sound of birch and pine and running water; a land of sunny upland pastures, of sumach thickets and shaded streams, of rich, if somewhat swampy hardwoods. To the north ran a long windbreak of pines that climbed suddenly up to the skyline over the shoulder of a great bare hill, outpost of a whole host of others more distant, from a few of which one sometimes caught a far-off glimpse both of Rice Lake and of Lake Ontario at a single halt. It was among the branches of the last pine in sight on the slope that I had got my first close view of a Mourning Dove one hot September afternoon. On the edge of that sloping wood to the west, with its intersecting runnels of cold spring water, we seldom failed to mark, in May or early June, the gorgeous plumage of the Scarlet Tanager and hear its pleasing notes; under its pines abound morels and the Gyromitra or Curly Cap, a rich mahogany-brown cousin of the Morel; once or twice in its sequestered dells we had been held spell-bound by the exquisite grace of the Yellow Ladies' Slipper, and once at least by the deathly still, pale beauty, appalling in its tranquillity, of the Destroying Angel (*Amanita phalloides*). Just north of us runs eastward a path leading to the Bethel road; and here on its south margin, beyond a spongy bit of marsh where spears of the Adder's Tongue fern thrust up, if you look about you carefully, you will make the same happy discovery that I made many years ago, the double surprise of a whole row of blue beech, that somewhat uncommon kinsman of the Ironwood or Hop hornbeam, and beyond them, hidden from the path by some cedars, a flourishing colony of the Hay-scented Fern (*Dicksonia pilosiuscula*) with its beautiful spreading fountain of finely cut green fronds; the only station I know for this species within 10 miles of Port Hope. A few yards south of where we were lunching, under a fringe of evergreen, while gathering morels one day in May, I flushed a partridge from its nest of 13 eggs. The whole place teemed with happy memories! As the

eye brooded over the scene, the spirits of a thousand vanished hours started from every nook and corner of the land.

After lunch we moved south through the narrow strip of woodland. The first section of this was mixed wood, and many trees were lying about in the unsightly confusion known as a "slash;" some of them had been felled two or three years before, others had fallen soon after, victims of the first gale that smote their unprotected flanks. It was hot work and slippery making one's way from point to point, and only a succession of lucky finds kept one going at all.

My first strike was where a butternut and a maple had fallen together; on a limb and some boughs of the former I took 3 or 4 more specimens of *Neoclytus erythrocephalus* racing madly along in the sunshine; and on the under side of the maple trunk,—it was a lean-to—I captured one specimen of *Urographis fasciatus* and one of *Goes oculatus;* on a near-by elm I took several *Physocnemum brevilineum* and 2 specimens of *Saperda tridentata*, and finally on a basswood 2 or 3 seasons dead, a specimen of *Saperda vestita* and 3 of *Hoplosia nubila*, the latter evidently just emerged from a dead and broken bit of limb half way up the trunk.

Further south the strip of woodland had been almost entirely pine with an occasional oak, not heavily wooded, but with many open glades made beautiful by beds of bracken interspersed with orange lilies; it was here that I had first found in any abundance, among blossoms of the large wild geranium, the pretty little longhorn—pale yellow, decorated with spots of black—*Pachyta monticola*. Now, hardly a tree was left standing, and the whole space was invaded by a wilderness of tall, rank grass and weeds; here and there, half buried in the vegetation, lay heaps of decaying pine brush, and from some of the larger branches, carefully picked up and scanned, were taken 6 or 8 specimens of *Leptostylus sexguttatus*. Finally as we reached the higher ground at the south end of the plateau, where fewer trees had been felled, I captured a specimen of *Leptura zebra* just climbing up through the sheaf of leafy shoots about an oak stump. Two or three years before when first some of the oak and other hardwood here had been felled, I had taken early in July quite a number of good things by laying chips of freshly prised bark on the sappy stumps, my captures including the handsome *Calloides nobilis*, *Arhopalus fulminans; Centrodera decolorata*, and a small species of the Oak-pruner (*Elaphidion*). But now, though empty tunnels and fresh borings gave ample evidence of insect life in the dead wood, there was nothing visible on stump or trunk except this solitary specimen of *Leptura zebra*, an insect I have occasionally captured pollen-feeding in the clusters of New Jersey Tea as well as on oak stumps.

And here under the pines near the edge of the most southerly slope one gladly sprawled for a few minutes' rest, looking out across the plains to Lake Ontario and Port Hope, and ruminating pleasantly over the past. Then up for a four-mile stretch by side-road, lane and field, fragrant of wild grape and sweet briar, and so home at last, dog-tired, hungry as hunters, and every bit as happy.

TWO NEW SPECIES OF APHIDIDÆ FROM JAPAN.

BY RYOICHI TAKAHASHI,
Forest Experiment Station, Meguro, Tokio, Japan.

Stomaphis pini, n. sp.

Winged viviparous female.

Head, antennæ, eyes, thorax, legs, cornicles and cauda black. Abdomen nearly pale brown, above blackish, darkest at the part between the cornicles, and with a dark brown spot on the under side of each segment. Wings somewhat dusky, stigma and veins black, veins shadowed. Body long and rather narrow, nearly parallel-sided, and with many fine hairs. Head very short, compound eyes rather small, supplementary eyes visible. Antennæ somewhat slender, with many hairs, the first joint longer and broader than the second. The relative lengths of the 3rd and the following joints are as follows:

III 74, IV 30, V 27, VI 38.

The third joint has about fifteen very large sensoria on the entire length, the fourth about 4 and the fifth only the usual one.

Wings slender, stigma large, the third oblique, twice forked, stigmatic vein extending to the apex of the wing, the second oblique of the hind wing very long hooklets five in number. The ninth abdominal segment with a small tubercle on the side. Cornicles very short. Caudá short, with many hairs. Legs

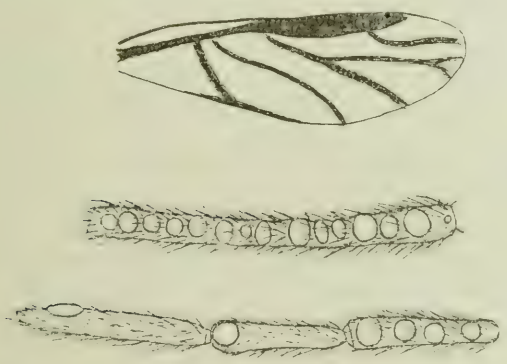

Fig. 13.—*Stomaphis pini*, n.sp., winged viviparous female; antenna (the 3rd to 6th joints) and fore wings.

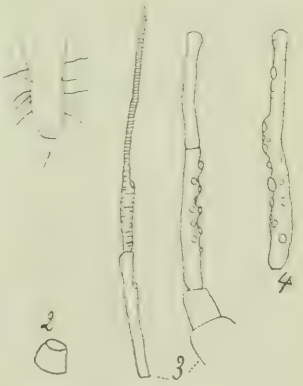

Fig. 14.—*Brachycolus gramini*, n.sp., winged viviparous female. 1. Cauda. 2. Cornicle. 3. Antenna. 4. The 3rd antennal joint of a female.

slender and long, hind legs much longer. Length of body 5.5 mm. Antennæ 2.3 mm. Rostrum 11.0 mm. Hind leg 5.4 mm. Fore-wing 5.5 mm. Hind wing 3.5 mm. Width of fore-wing 1.5 mm.

Host.—*Pinus densiflora*.

Type locality.—Tokio, Japan.

Many winged viviparous females which are probably sexuparæ, are found in November.

Brachycolus gramini, n. sp.

Wingless viviparous female.

Body black, somewhat greenish, densely covered with a white powder. Eyes, distal half of antennæ, cornicles, cauda, femora except distal half of the

fore femur and tarsi black. The third and fourth antennal joints and the basal portion of the fifth yellowish green. Distal half of the fore femur brownish, tibiæ yellowish brown.

Body rather oval, not elongated, without hairs. Antennæ much shorter than the body, without hairs. The relative lengths of the third and subsequent joints are as follows: III 22, IV 17, V 22, VI 50 (15+35). Rostrum reaching the middle coxæ. Cornicles very small, broader than long. Cauda large, rounded at the apex. Legs short.

Length of body 1.7 mm. Antenna 0.8 mm.

Winged viviparous female.

Nearly similar to the wingless female in colour. Wings hyaline, veins black.

Antennæ nearly as long as the body, the relative length of the distal four joints is as follows: III 28, IV 23, V 25, VI 50 (15×35). The third joint with about twelve large sensoria, the fourth joint wanting sensoria usually. In some individuals the antennæ are only 5-jointed. Cornicles broader than long, broadest at the base, cauda large, the apex rounded, with some long, fine hairs. Legs slender. The third oblique vein twice forked, hooklets two.

Length of body 1.1 mm. Fore-wing 2.2 mm. Antenna 1.0 mm.

Host.—A plant belonging to the Gramineæ.

Type locality.—Tokio, Japan.

This species is very common from August onwards throughout the summer, and during this period many winged females appear.

TWO UNDESCRIBED PEDICIINE CRANE-FLIES FROM THE UNITED STATES (TIPULIDÆ, DIPTERA).

BY CHARLES P. ALEXANDER.
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The two new species herein described were included in material sent for determination. The new *Dicranota* found by Mr. Lindsey is of especial interest. The *Rhaphidolabis* shows the greatest resemblance to *R. tenuipes* in its general features, but the structure of the hypopygium shows it to be a very distinct species.

Dicranota iowa, sp. n.

Size large (wing ♀ over 9 mm.); general coloration light grey, the mesonotal praescutum with four dark brown stripes; wings brownish grey, the stigma and a seam along the anterior portion of the cord dark brown; Cell M^1 lacking.

Female.—Length 8–8.3 mm.; wing 9.5–10 mm.

Rostrum and palpi dark brown. Antennæ dark brown throughout, with thirteen segments; in the female sex, the flagellar segments are short-cylindrical, closely approximated. Head with the front and a narrow margin surrounding the eyes light yellowish grey; vertex with the disk rich brown, becoming paler on the occiput.

Mesonotal praescutum light yellowish grey with four dark brown stripes, the intermediate pair separated by a capillary line of the ground colour; scutum grey, the lobes dark brown; scutellum and postnotum grey. Pleura grey. Halteres short, the stem yellow, brightest basally, the knobs brown. Legs with

the coxæ light grey, the tips more yellowish; trochanters brownish yellow; femora dark brown, paler basally; tibiæ and tarsi dark brown. Wings with a brownish grey tinge; stigma dark brown, completely filling the space between *r* and the deflection of R^2 and occupying the outer end of cell Sc^1; a strong brownish tinge at the origin of *Rs* and along the deflection of R^{4+5} and *r-m;* less distinct seams along *Cu* and the other veins and cross-veins; veins dark brown. Venation: Sc^1 ending just beyond *r; Rs* long for a member of this genus, strongly angulated and sometimes spurred near origin, longer than that section of R^{2+3} between *r* and the deflection of R^2; R^{2+3+4} variable in length, unusually short in the type; *r* on R^{2+3} a little more than its length beyond the fork; R^2 meeting R^1 a short distance from the tip of the latter; cell M^1 lacking; basal deflection of Cu^1 approximately equal to or shorter than R^{2+3+4}.

Abdomen dark brown, the extreme lateral margins of the segments paler. Ovipositor horn-coloured, the valves strongly upcurved.

Habitat.—Iowa.

Holotype.—♀; Sioux City, April 17, 1916, (A. W. Lindsey).

Paratopotype.—♀.

Type in the collection of the Illinois State Natural History Survey.

The specimens of this interesting crane-fly were given to Mr. Malloch by the collector to whom we are indebted for this material. In its size and general appearance, *Dicranota iowa* resembles *D. argentea* Doane (Western North America) but is readily told by the absence of cell M^1 of the wings. From the Eastern species that lack this cell (*rivularis* O. S., *eucera* O. S.), it may be told by the larger size, the long, angulated radial sector and the conspicuously marked wings.

Rhaphidolabis persimilis, sp. n.

Very similar to the genotype, *R. tenuipes* O. S., but differing very strikingly in the structure of the male hypopygium.

The pleurites are stout, the proximal face near the base produced into a small, slender, clavate lobe which is provided with numerous long, pale setæ at the tip; the proximal face of the pleurite is produced into a conspicuous, flattened, strongly bifid, pincer-like blade, the outer arm slender, curved, the inner arm flattened into a blade. The pleural appendages are two in number, rather small, of approximately equal length; inner appendage long-oval, densely set with chitinized spines; the outer appendage is flattened, broad basally, the short apex bluntly rounded. The gonapophyses appear as comparatively small chitinized hooks.

Rhaphidolabis tenuipes has the appendages similar but all conspicuously elongated; the flattened blade-like extension of the inner face of the pleurite is here very large, almost contiguous with its mate of the opposite side; this pale blade is subquadrate basally, the outer angle produced into a narrow, slightly curved arm, the margin of which bears numerous, small, appressed teeth. The pleural appendages are slender, the inner one especially so; the outer appendage is broad basally, inconspicuously bifid, the outer arm produced into a long, slightly twisted, flattened blade whose apex is evenly rounded and provided with a few small setæ. The gonapophyses are similar to those in *R. persimilis* but the recurved tips are very long, nearly equal to the stems that bear them.

Habitat.—Virginia.

Holotype.—♂, Difficult Run, Potomac River, October 28, 1917, (W. L. McAtee).

Paratypes.—♂, Great Falls, April 20, 1913, (C. P. Heinrichs); 2 ♂'s, Dead Run, May 10, 1916, (W. L. McAtee); 1 ♂, Virginia, near Plummer's Island, September 29, 1915, (W. L. McAtee).

HEMIPTERA FROM PEAKS ISLAND, MAINE, COLLECTED BY MR. G. A. MOORE.

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During the seasons of 1918 and 1919 my friend Mr. G. A. Moore had brief opportunities for collecting on Peaks Island, in Portland Harbor, and has been kind enough to send to me for study the Hemiptera which he gathered there. This collection proves to be of considerable interest and merits a full report, especially since the published records from this part of Maine are very meagre. Some of the species are additions to the state list; one, *Stygnocoris rusticus*, has never before been found in the United States; and another is the first American representative of the Anthocorid genus *Tetraphleps*.

SCUTELLERIDÆ.

Homaemus aeneifrons (Say). 1 Aug, '18, 4 Aug. '19.
Eurygaster alternata (Say). 3 Aug. '19.

CYDNIDÆ.

Thyreocoris pulicarius (Germar). 8 Aug. '19.

PENTATOMIDÆ.

Peribalus limbolarius Stal. 3 Aug. '18. New to the Maine list.
Mormidea lugens (Fabricius). 23 July, '18.
Euschistus tristigmus (Say). 28 July, '18.
Neottiglossa undata (Say). 27 July, '18.
Cosmopepla bimaculata (Thomas). 26 Aug., '19.
Meadorus lateralis (Say). 1 Aug., '19.
Elasmostethus cruciatus (Say). 4 Aug., '18.
Podisus modestus (Dallas). 8 Aug., '19.
Podisus placidus Uhler. 26 Aug., '19.

NEIDIDÆ.

Neides muticus (Say). 29 July, '18.

LYGAEIDÆ.

Nysius ericæ (Schilling). 2 Aug., '18.
Ischnorhynchus geminatus (Say). 31 July, '18; 10 Aug., '19.
Phlegyas abbreviatus (Uhler). 24 July, '18.
Ligyrocoris diffusus (Uhler). 29 July, '18.
Ligyrocoris contractus (Say). 27 July, '19.
Kolenetrus plenus (Distant). 26 July, '18.
A male of this rare species, new to the Maine list, was found under moss.
Stygnocoris rusticus (Fallén). 31 July, '18; 8 Aug., '19.

This European species has recently been reported from Quebec and Nova Scotia. Its characters are discussed by Barber in one of his valuable papers on the Lygaeidæ,[1] where he makes the comment, "The species has not yet been found within the United States, but it should occur in the mountainous parts of New England and New York." Boreal forms are likely to occur anywhere in Maine, becoming restricted to mountainous regions as their range extends southward.

TINGIDÆ.

Corythucha marmorata (Uhler). 31 July, '19.

Corythucha juglandis (Fitch). 10 Aug., '19.

Corythucha pyriformis, sp. nov.

Membranous portions very clear hyaline, the surface shining; disc of pronotum brown; dorsal veinlets of hood very slightly marked with brown; paranota with a single distinct dark brown spot before middle; median carina with a very indistinct brown spot; lateral carinæ and apex of angulate process white with a brownish tinge. Hemielytra with distinct dark brown basal and apical bands, the latter equal in width to one-third entire length of hemielytron, enclosing three or four large, almost entirely hyaline areoles, the apical row of areoles largely hyaline from apex of wing inwardly. Antennæ, legs except tarsi, and edges of plates forming rostral groove yellow.

Hood slightly higher than median carina and somewhat longer, its height one-half its length, its width not quite one-third width of entire pronotum (14–46); hood pyriform, slightly constricted, sides convergent anteriorly and but slightly concave as viewed from above, anterior lobe thus not distinctly marked off; dorsal areoles very large; hood as seen in profile very slightly rounded above except at ends, moderately arcuate as a whole. Median carina slightly shorter than hood (24–26), slightly and angulately arched, with two rows of areoles at middle, its height less than one-third its length (7–24). Lateral carinæ moderately developed, with three or four areoles, terminating far from base of hood. Paranota large, unusually expanded anteriorly and together widest well before middle. Costal margin of hemielytra nearly straight; marginal spines of paranota and hemielytra few and rudimentary; discal elevations of moderate size, with sharp dorsal edge, not strongly inflated; costal area largely triseriate; hemielytra broadly rounded at apex. Antennæ with numerous setæ. Length ♂ 4.08 mm.; width 2.34 mm.

Holotype ♂, Peaks Island, Maine, 31 July, '19, (G. A. Moore), in my collection. Paratype ♂, Franconia, New Hampshire (Mrs. A. T. Slosson), in Mrs. Slosson's collection.

This species is closely related to *pruni* Osborn and Drake, although by following Gibson's key[2] strictly it runs to *hoodiana* Osborn and Drake. From the former it may be distinguished by the structure of paranota and hood, the slight development of marginal spines, and broader form. The latter, known only from Oregon, is described as larger (length 4.3 mm.), with strongly constricted hood.

Melanorhopala clavata Stal. 26 Aug., '19.

1. Concerning Lygaeidæ.—No. 2. Jour. New York Ent. Soc., Vol. 26, 1918, p. 53.
2. The Genus Corythucha Stal. Trans. Am. Ent. Soc., Vol. 44, 1918, p. 74.

NABIDÆ.

Nabis subcoleoptratus Kirby. 29 July, '18.
Nabis ferus (Linné). 31 July, '19.
Nabis roseipennis (Reuter). 25 July, '18; 1 Aug., '19.

There is difference of opinion concerning what I take to be the short-winged female of this species. Some are inclined to consider that such specimens represent the *Nabis inscriptus* of Kirby, as redefined by Reuter,[3] but the only distinctive character given by the latter author, applicable to the female, is the short first antennal segment, and I have yet to see a specimen exhibiting this feature; moreover, Reuter states that *inscriptus* is very similar to brevis, from which it is distinguished by its smaller head and less prominent eyes, and, it would seem, its shorter first antennal segment.

Nabis rufusculus (Reuter). 26 July, '19.

Certain of the commonest species of *Nabis* present perplexing difficulties in determination. It is hoped that the following key to the north-eastern species will aid in identification of specimens and serve to draw the attention of students to these interesting forms. Some time ago I was privileged to spend an evening with my friend H. G. Barber in the study of his collection and MS. notes on this group, and with his permission I have incorporated in this synopsis the pertinent results of that conference. Subsequent study has shown that Reuter's subgeneric criteria are of great value in understanding the group, and that the male genital characters, emphasized by Reuter, should not be neglected.

1. Body in large part shining black; head distinctly and obliquely narrowed behind eyes; front femora without spines; wing cell with hamus arising from origin of decurrent vein (Subgenus *Nabicula* Kirby); length 9-10.5 mm ..... *subcoleoptratus* Kirby.
   Body wholly or in large part pallid or brown; head parallel or nearly so behind eye ..... 2.
2. Front femora with minute spines below; wing cell with hamus; connexivum more or less distinctly spotted; femora spotted, annulate at apex; tibiæ annulate (Subg. *Hoplistoscelis* Reuter); length 6.4–7 mm ..... *sordidus* Reuter.
   Front femora without spines; connexivum usually not spotted ..... 3.
3. Femora with a subapical dark ring; wing cell without hamus; hind lobe of pronotum distinctly punctate (Subgenus *Lasiomerus* Reuter); length 8–9.5 mm ..... *annulatus* Reuter.
   Femora without ring; wing cell with hamus; hind lobe of pronotum almost or quite impunctate ..... 4.
4. Form elongate; short-winged forms with hemielytra less than three times length of scutellum; first antennal segment generally about as long as head; hamus arising very near or at origin of decurrent vein; long-winged forms extremely rare (Subgenus *Dolichonabis* Reuter) ..... 5.
   Form broader, more or less ovate; short-winged forms usually with much longer hemielytra; first antennal segment generally shorter than head; hamus arising from decurrent vein; long-winged forms common as a rule (Subgenus *Nabis* Latreille) ..... 6.

3. Bemerk. ueb. Nabiden, Mem. Soc. Ent. Belgique, Vol. 15, 1908, pp. 87–130.

5. Form very narrow; head about five times longer than wide between eyes; hemielytra in short-winged form rounded at apex, membrane lacking; length 9–12.5 mm.....*propinquus* Reuter.
   Form broader; head about three times longer than wide between eyes; shortened hemielytra truncate at apex, membrane present; length 7.5–8.75 mm.....*limbatus* Dahlbom.
6. Hemielytra in long-winged form without three brown dots; undeveloped hemielytra much shorter than abdomen; dorsal surface of abdomen dark brown, margin of connexivum and single or double median stripe pale; length 8–9 mm.....*flavomarginatus* Scholz.
   Hemielytra in long-winged form with three brown dots, one on disc of corium, two on membranal suture; undeveloped hemielytra about as long as abdomen; dorsal surface of abdomen without median stripes....7.
7. First antennal segment very slightly longer than anteocular portion of head; dorsal surface of abdomen black; tibiæ with black dots; copulatory hooks of male with large semicircular short-pointed blade and short stem (*fide* Reuter).....*inscriptus* Kirby.
   First antennal segment much longer than anteocular portion of head....8.
8. Colour gray; form narrow; markings of posterior surface of front and middle femora tending to become a transverse striping; tibiæ immaculate.....9.
   Colour reddish to dark brown; form broader; femora conspicuously spotted, less tendency to striping.....10.
9. Anterior femora extending beyond apex of head; copulatory hooks of male with large semicircular blade and stem broadened basally; length 6.5–8.5 mm.....*ferus* Linné.
   Anterior femora not reaching apex of head; copulatory hooks with small elongated blade and broad arcuate stem; length 6–6.5 mm. (recently introduced from Europe).....*brevis* Scholz.
10. Posterior tibiæ dotted; colour dark brown; membrane in short-winged form with closed cells; hooks with small triangular blade and long, broad, undulated stem; length 6.5–8.5 mm.....*roseipennis* Reuter.
    Posterior tibiæ immaculate; colour pale reddish brown; membrane in short-winged form without closed cells; hooks with large, semicircular long-pointed blade and short stem; length 5.6–7 mm...*rufusculus* Reuter.

ANTHOCORIDÆ.

Genus **Tetraphleps** Fieber.

Fieber, Wien. Ent. Monat., Vol. 4, 1860, p. 262, Pl. 6, Fig. F; Id., Eur. Hem., 1861, pp. 37–38, 135–136.

Reuter, Monog. Anthoc., 1884, p. 56, 85.

Slosson, Ent. News, Vol. 17, 1906, p. 326.

Body finely pubescent; eyes slightly distant from pronotum; first rostral segment not extending beyond insertion of antennæ; second antennal segment clavate, third and fourth fusiform. Sides of pronotum explanate and suddenly curved inward anteriorly, extending more or less beyond level of base of pronotal collar. Membrane with four distinct veins. Metasternal canals nearly or quite straight, very slightly oblique, tending posteriorly, prominently

elevated and free apically, the longitudinal line extremely fine, very slightly curved, forming a right angle with the canal.

This genus is distinguished from *Anthocoris* Fallén especially by the explanate lateral margins of the pronotum, more distinctly punctate hemielytra, and the apical prominence of the metasternal canals.

North American species of this palaearctic genus are here recorded for the first time, although Mrs. A. T. Slosson in her tenth Mount Washington list includes "Tetraphleps, n. sp." Finding an example of this genus among Mr. Moore's material, I wrote Mrs. Slosson in regard to the matter, and I am indebted to her kindness for the privilege of examining the specimen (determined as above by Heidemann) which served as a basis for the Mt. Washington record. This proves to be distinct from the Peaks' Island specimen. Mr. Van Duzee has kindly sent for study an Ontario example, identical with the Peaks' Island individual, which he had independently recognized as undescribed. Both species are distinct from the old world forms, and are characterized herewith.

Tetraphleps americana, sp. nov.

Dark piceous; head, pronotum, and scutellum concolorous; second antennal segment more or less distinctly paler at middle. Hemielytra light brown, variegated; apex of clavus, corium and embolium inwardly, most of cuneus, and the sutures and veins darker; membrane smoky brown, basal and two lateral spots, and vittæ following veins white; membranal suture polished, broadly black from apex of clavus to origin of outer vein. Ventral surface and legs dark piceous; apices of femora, thoracic sterna, pleura, and epipleura (of hemielytra) paler. Rostrum piceous or black.

Dorsal surface shining, with conspicuous slightly curled pale pubescence and a few long, erect black setæ on head, pronotum, and scutellum. Head elongate (23–20 including eyes, excluding collar); vertex longitudinally rather convex, eyes moderately prominent, the transverse diameter of an eye not quite equal to one-half width between eyes (5–11); length of anteocular portion slightly more than twice the length of an eye. Juga strongly constricted before insertion of antennæ, compressed and prominent at apex; anterior and of tylus rounded, apex of head thus bi-emarginate. Rostrum extending well beyond front coxæ, second segment becoming slenderer before middle, more than twice length of third (30–14). Antennæ with fine pale pubescence and rather numerous long erect setæ, longer than head and pronotum together (52–45); first segment reaching middle of expanded portion of juga; second segment in length equal to width of head including eyes, enlarged in apical third; third almost cylindrical; fourth fusiform, thicker than second at apex; third and fourth equal in length, together longer than second (26–20). Pronotum obsoletely rugulose, with sparse, minute, but sharply distinct punctation posteriorly; length on median line two-fifths width at base; posterior margin broadly rounded at middle; lateral margins straight, strongly convergent, slightly rounded anteriorly; explanate portions very narrow, scarcely reflexed, reduced to a fine carina behind middle, extending anteriorly but little beyond level of base of collar. Scutellum polished, slightly tumid at base, transversely depressed just behind middle, transversely rugulose at apex. Hemielytra slightly narrower than abdomen at base of cuneus (♀), apex of latter acute; length of membrane be-

yond level of cuneal apices distinctly less than length of cuneus; veins of membrane distinct, variable, connected apically by a very feeble arcuate vein. Length ♀ 3.35–3.67 mm.; width 1.39–1.50 mm

Holotype.—♀, Peaks Island, Maine, 3 Aug:, 1919, (G. A. Moore), in my collection.

Paratype.—♀, Ottawa, Canada, 1 Sept., 1905, (A. Gibson) (bears also label reading Gibson 7–21–12), in Van Duzee's collection.

This species is especially distinguished by the very narrow explanate margins of the pronotum, which do not extend forward to the middle of the pronotal collar and turn sharply inward and backward as they do in the palæarctic *bicuspis* Herrich-Schaeffer (*vittatus* Fieber). The proportions of antennal and rostral segments are somewhat different, the surface is more shining, and the fine pubescence of the dorsal aspect is twice as long in *americana*. Through the kindness of Mr. E. H. Gibson I have had for comparison a fine series of *bicuspis*, collected and determined by Montandon.

Tetraphleps uniformis, sp. nov.

Similar to *americana* except in the following characters:

Colour almost uniform light brown, head a shade darker, hemielytra a shade lighter. Membrane light smoky brown, with a very vague paler area at base and one along middle portion only of each vein. Tibiæ inwardly and apices of femora pale.

Head excluding collar and including eyes as long as broad; the diameter of an eye distinctly less than one-half width of vertex (5–13); length of anteocular portion distinctly less than twice the length of an eye (12–8). Antennæ long and slender, much longer than head and pronotum together (60–45); first segment reaching almost to apex of juga; second segment longer than width of head including eyes (24–22). Pronotum distinctly transversely rugulose in basal area, the punctures here most extremely fine. Basal emargination very obtusely angulate, not rounded (possibly a variable character). Lateral explanate margins very narrow, but appreciably reflexed. Apex of cuneus narrowly rounded. Membrane long, its length beyond cuneal apices equal to length of cuneus. Length ♀ 3.68 mm.; width 1.46.

Holotype.—♀, Mt. Washington, New Hampshire (Mrs. A. T. Slosson), in Mrs. Slosson's collection.

This species may be distinguished from *americana* by its pale, uniform coloration and by the proportions of head, antennæ, and membrane. Probably the American forms will be found to occur on coniferous trees, since the European *T. bicuspis* is reported as frequenting firs and larches in England.

Van Duzee has communicated to me his opinion that Provancher's description[4] of *Tetraphleps canadensis* seems to refer to a true Tetraphleps, although the specimen bearing this name in the Provancher collection is a species of Lyctocoris. The mention of hemielytra "à coin fort long" and membrane "avec 4 nervures longitudinales très distinctes" would favour this opinion, but on account of the omission of more important characters it is hardly possible to reach a certain conclusion. Provancher's description is scarcely detailed enough for specific recognition, and even as far as it goes it fails to apply closely to either of the species characterized above.

4. Pet. Faune Ent. Can., Vol 3, 1886, p. 90.

Triphleps insidiosa var. *tristicolor* White. 29 July, '18. New to the Maine list.

MIRIDÆ.

Collaria meilleurii Provancher. 29 July, '18; 1 Aug., '19.

Miris dolabratus (Linné). 24 July, '18.

In his exhaustive accounts of this species,[5] Professor Osborn advances the hypothesis that it is an introduced form, having reached this country about 1800, but it seems to me at least equally probable that it is truly holarctic. Horvath[6] includes *dolabratus* in his list of species which owe their presence here "non à une importation artificielle," adducing divers general considerations not touched upon by Osborn. With reference to the five arguments proposed by the latter, we may note that the early records of Hemiptera omit also many very common and certainly native forms and are in general too fragmentary to have much weight in the matter; that the indications of "a gradual westward and southward dispersal" may possibly be correlated with the spread of interest in the Hemiptera rather than with the movements of the species; and that the presence of *dolabratus* in the interior of British Columbia (Lillooet) and in wild parts of northern Maine (Traveller Mt.), according to records which I have published, is not very likely to be due to the introduction of cultivated grasses from Europe. The species occurs in Siberia, as well as in Europe, and we should await further evidence from the interior of British America and from Alaska before considering the question as settled.

Stenodema vicinum (Provancher). 24 July, '18; 3 Aug., '19.

Platytylellus insitivus (Say). 4 Aug., '19.

Pithanus maerkelii (Herrich-Schaeffer). 30 July, '18; 31 July ,'19.

Another species which may be either holarctic or introduced.

Neurocoplus nubilus (Say). 31 July, '18.

Phytocoris lasiomerus Reuter. 3 Aug., '19.

Phytocoris pallidicornis Reuter. 8 Aug., '19.

Phytocoris eximius Reuter. 6 Aug., '19.

Phytocoris tibialis Reuter. 3 Aug., '19. New to the Maine List.

Phytocoris mundus Reuter, var. 31 July, '18.

Adelphocoris rapidus (Say). 31 July, '19.

Poeciloscytus basalis Reuter. 3 Aug., '18.

Capsus ater (Linné). 24 July, '18.

Coccobaphes sanguinareus (Uhler). 10 Aug., '19.

Lygus pratensis var. *oblineatus* (Say). 3 Aug., '18.

Lygus pabulinus var. *signifer* Reuter. 27 July, '18; 10 Aug., '19.

Lygus confusus Knight. 10 Aug., '19.

One male and two females of this species, hitherto known only from the single type and an associated female. Knight has studied and determined these specimens.

Lygus communis Knight. 3 Aug., '19.

Lygus omnivagus Knight. 27 July, '18.

Lygus belfragei Reuter. 2 Aug., '18; 28 July, '19.

5. The meadow plant bug, Bull. Maine Agr. Exp. Sta., No. 276, 1919. The meadow plant bug, Miris dolabratus, Jour Agr. Research, Vol. 15, 1918, pp. 175–200.

6. Rels. entre faunes Hém. Eur. et Am., Ann. Mus. Nat. Hungarici, Vol. 6, 1908, pp. 1–14.

The second specimen recorded has the clavus entirely dark and the apical dark spots of corium larger than usual though, as is characteristic of the species, they fail to reach the lateral margins.

Lygus hirticulus Van Duzee. 29 July, '18.
Camptobrochis nitens Reuter. 8 Aug., '19.
Camptobrochis sp. 30 July, '19.
Determined by Knight, who is at work on the genus.
Monalocoris filicis (Linné). 29 July, '18; 10 Aug., '19.
Hyaliodes vitripennis (Say). 30 July, '19.
Dicyphus agilis (Uhler). 30 July, '18.
Dicyphus famelicus (Uhler). 26 Aug., '19.
Strongylocoris stygicus (Say). 6 Aug., '19.
Pilophorus amoenus Uhler. 31 July, '18.
Lopidea media (Say). 29 July, '19.
Diaphnidia pellucida (Uhler). 30 July, '19; 4 Aug., '18.
Orthotylus flavosparsus (Sahlberg). 31 July, '18.
Orthotylus cruciatus Van Duzee. 2 Aug., '18.
Ilnacora malina (Uhler). 3 Aug., '19.
Onychumenus decolor (Fallén). 26 July, '19.
Plagiognathus spp.
Several species which cannot be determined at present.
Campylomma verbasci (Meyer-Dür). 29 July, '18.

GERRIDÆ.

Gerris marginatus Say. 28 July, '18; 8 Aug., '19.
Limnoporus rufoscutellatus (Latreille). 8 Aug., '19.

NOTES ON THE LARVÆ AND PUPÆ OF CERTAIN PTEROPHORID SPECIES. (LEPID.).*

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In the vicinity of Chelsea, Que., a small village on the Gatineau River about nine miles north of Ottawa, I found the larvæ of four Pterophorid species quite abundant during the latter half of May, 1919. Two species, *Pterophorus elliotti* Fern. and *P. eupatorii* Fern., occurred on *Eupatorium;* two others, *Pterophorus homodactylus* Wlk. and *Trichoptilus lobidactylus* Fitch. fed on the terminal buds of a *Solidago* species, the latter being very numerous, the former comparatively rare.

Dr. Dyar (1898, Psyche, VIII, 249) has already published notes on the larval and pupal stages of three of these species, viz., *T. lobidactylus*, *P. elliotti*, and *P. eupatorii;* in the same paper he is inclined to doubt the specific distinctness of *P. homodactylus* from *P. elliottii*, which is not to be wondered at when the great similarity of the adults is taken into consideration. Dr. Dyar is correct in considering the larval description of *homodactylus* published by Fernald in his monograph of the Pterophoridæ (p. 41) to be that of *elliotti;* both larva and pupa of the true *homodactylus* (the *Solidago* feeder), however, show excellent characters whereby they may be separated from *elliotti* and the two are undoubtedly distinct species.

April, 1920

I append my notes on the larvæ and pupæ of all four species as they serve to amplify in some instances Dr. Dyar's notes; the figures of the pupæ show the very characteristic arrangement of tubercular setæ and secondary hairs, a feature quite constant in each species.

Trichoptilus lobidactylus Fitch.

Larva (full-grown).—Head ochreous. Body cylindrical, green, with slightly darker mediodorsal line, due to the dorsal vessel showing through the integument, and containing on each segment centrally a minute black dot; several other similar black points are scattered with more or less regularity over the integument, the most constant being a single one midway between tubercles II and III and another, rather linear in shape, before the spiracle. Subdorsally there is a series of large, brownish, rectangular, chitinous patches extending across the major portion of each segment and containing tubercles I and II which are represented by two long brownish setæ, arising from the centre of each patch, very glutinous, swollen irregularly several times during their length and club-shaped at their tips; the posterior portion of each patch contains two minute, whitish, club-shaped setæ. Tubercle III is represented on the abdominal segments by a single long brownish seta, a short anterior whitish one and a minute posterior hair (?IIIa of Dyar). Tubercle IV+V, directly below the spiracle, consists of an anterior shorter and a posterior longer clubbed white seta arising from a brownish base: there are usually also two further minute white clubbed hairs situated respectively on the ventral and on the posterior margins of this dark base. Ventral to the tubercles and on the posterior margin of each segment are generally several minute white clubbed hairs. A single white unclubbed hair arising from a dark base and surrounded by other minute hairs probably represents tubercle VI and two or three small hairs at the base of the prolegs constitute tubercle VII.

On the thoracic segments the dorsal setæ show some variation from that normally found on the abdominal segments; on the mesothorax tubercle I+II consists of two long setæ and one minute white one whilst on the metathorax only a single long dorsal hair is found. On both segments tubercle III shows two long setæ. The prothorax has a row of six long hairs along the anterior margin with a second row of six immediately behind these; the dorsal area corresponding to the prothoracic plate is covered with fine, minute, white, clubbed hairs. Ventrad and anterior to the spiracle is a tubercle bearing three hairs. All spiracles pale, brown-ringed. Length 10 mm.

The arrangement of tubercular hairs as listed above differs in several points from Dr. Dyar's figure of the fifth abdominal segment of this species (1899, Ent. Rec. XI, pl. 1, Fig. 1) but this is in the main due, I believe, to slight inconstancy in the number of small white secondary hairs which may occur on each primary tubercle; Dr. Dyar's figure accentuates these secondary hairs, giving the impression that they are nearly as long as the primary, dark ones, which was far from the actual case in all specimens examined by me.

Pupa (Fig. 1).—Rather bluntly truncate at apex with four short horns arising from the base of the antennal and eye-sheaths and a distinct sub-dorsal ridge extending as far as fourth abdominal segment. Colour green, with the horns and surrounding area extending over the prothorax vinous pink; a large,

*Contributed from Entomological Branch, Department of Agriculture, Ottawa, Canada.

pink, dorsal patch is also present on each of the third and fourth abdominal segments (not segments 4–5 as stated by Dr. Dyar). The wing-cases are darker green than the remainder of the pupal integument and possess three more or less complete parallel rows of minute white clubbed hairs; the sheaths of the legs and mouth-parts are not very clearly differentiated and are well sprinkled with minute white warts or lenticles, particularly numerous on the eye caps. The tubercular setæ of the larval stage are present, tubercles I and II being situated on the subdorsal ridge and particularly prominent on the pink-coloured segments. The prothoracic plate and the dorsal portions of the other thoracic segments are heavily sprinkled with small white lenticles; these lenticles on the abdominal segments are generally restricted to the area contiguous to the tubercular setæ, this area being bounded posteriorly by a row of four or five short white clubbed hairs placed at regular intervals. The cephalic portion of the modified tenth abdominal plate contains a cluster of minute pinkish hairs and the cremaster is composed of a larger cluster of similarly coloured, glutinous hairs.

Pterophorus homodactylus Wlk.

Larva (full-grown).—Head pale greenish ochreous. Body light green with dorsal ochreous line broken in the centre of each segment so that the anterior portion tends to form a short inverted Y, and the posterior portion, commencing as a fine line, thickens into a small elongate diamond-shaped patch, again narrowing at the rear of each segment. A broken, subdorsal, ochreous line is also present, situated dorsad to tubercle III and curved downward on the posterior portion of each segment; traces of a spiracular line are present on the thoracic segments.

The hair arising from the tubercles is long, dull-white and slightly barbed; the normal arrangement of setæ on an abdominal segment is as follows:—tubercles I and II are distinct but contiguous; I has four long subequal setæ, II bears two similar ones and a further short posterior one, pointing backward. Tubercle III shows one long central seta and two shorter anterior ones, bent forward. On the first seven abdominal segments a single hair on the posterior margin of the segment dorsad to the spiracle probably represents IIIa. Tubercle IV+V is very large and situated directly on the lateral flange; it bears about twelve hairs, mostly long. Directly behind them is a tubercle bearing two medium-sized hairs and two short ones; this is presumably IIIb of Dyar. Tubercle VI, below the flange, bears ten to twelve hairs and VII is represented by several hairs at the base of the prolegs. The thoracic segments show the usual modifications: on the mesothorax I+II bears three long, subequal hairs and one short anterior hair and on the metathorax this number is increased by a single moderately long hair; both segments show a single hair directly posterior to this group. Tubercle III shows four setæ of which the central one is the longest; in line with the abdominal spiracles near the rear edge of the segment is a tubercle which bears one medium hair and one small hair pointing backwards (?IIIb). The prothoracic plate is not well defined; two large patches of white hair project over the head; behind these are two long single hairs and on the posterior portion three tubercles, the central one bearing two hairs and each lateral one three. Two large lateral tubercles with numerous hairs are

present, the raised spiracle being situated posterior to the upper one near the rear margin of the segment. Length 14 mm.

Pupa (Fig. 2).—Pale green, with long, white, subequal hairs; wing-cases *smooth* with fringe of short hair only on margin of primaries. The ends of the leg sheaths project free but unequally above the fifth and sixth abdominal segments; the inner sheaths (prothoracic legs) reach to the rear edge of the fifth segment, the outer ones (mesothoracic) to the middle of the sixth segment; beneath these a third pair (metathoracic) projects still further, reaching nearly to the rear edge of the segment. The antennal sheaths are slightly shorter than the prothoracic legs. Apex of pupa sloping gently forward to base of antennæ where a distinct crescentic flange or ridge is formed; a distinct subdorsal ridge is present, becoming obsolete caudad to the second abdominal segment. There is a narrow, cream-coloured dorsal stripe, a broad subdorsal one along the ridge, encircling tubercles I and II, two pale broken lateral stripes, slightly downwardly oblique from front to rear, the lower one broader and crossing tubercle III, and a creamy stripe along the lateral flange.

The tubercular setæ are reduced in number as compared with those of the larval stage; two white hairs arise from both tubercles I and II, tubercle III shows a single hair; tubercles IV and V appear to have become separated, both being situated on the lateral flange, the former with two, the latter with two or three smaller hairs. The number of dorsal hairs is increased on the two posterior abdominal segments and on the thoracic ones tubercle III shows the usual two setæ. There is on the prothorax a posterior row of eight setæ crossing the segment, a single lateral hair and a fringe of hairs across the apex.

Apart from the different arrangement of tubercular hairs and the distinct food plant, the larva may be readily differentiated from that of *elliotti* by the distinctly spiculate nature of the hair, the dull white colour of the same and the fact that the hairs are finer, subequal and considerably shorter than those of *elliotti;* the pupa is recognized by the lack of all secondary hairs and the absence of any fine hairs on the wing cases, except the single row along the lateral margin. In the imago the best point of distinction seems to be the absence in the present species of the dark costal streak above the base of the incision on the primaries; the whole costal portion from base to apex is suffused with smoky brown but there is no trace of the distinct dark costal streak which is clearly visible in *elliotti;* of course, in rubbed specimens an exact determination is most difficult.

Pterophorus elliotti Fern.

Larva (full-grown).—Head pale ochreous. Body light green with long, white, shiny, non-spiculate hairs from the tubercles, the longest being about 4 mm. in length. Except on the prothorax there is a distinct creamy dorsal line broken in the centre of each segment by a small, round dot of the ground colour; traces of a pale subdorsal line are visible crossing tubercles I and II, especially shortly before pupation; a somewhat broken pale lateral line midway between tubercles I and III and a similar spiracular line, broken on the posterior portion of each segment. Prothoracic plate indistinctly defined, the arrangement of setæ on this segment being similar to that found in *homodactylus*. On the other thoracic segments tubercle I+II bears two long, central hairs and three shorter ones, two anterior and one posterior. A single minute hair is situated

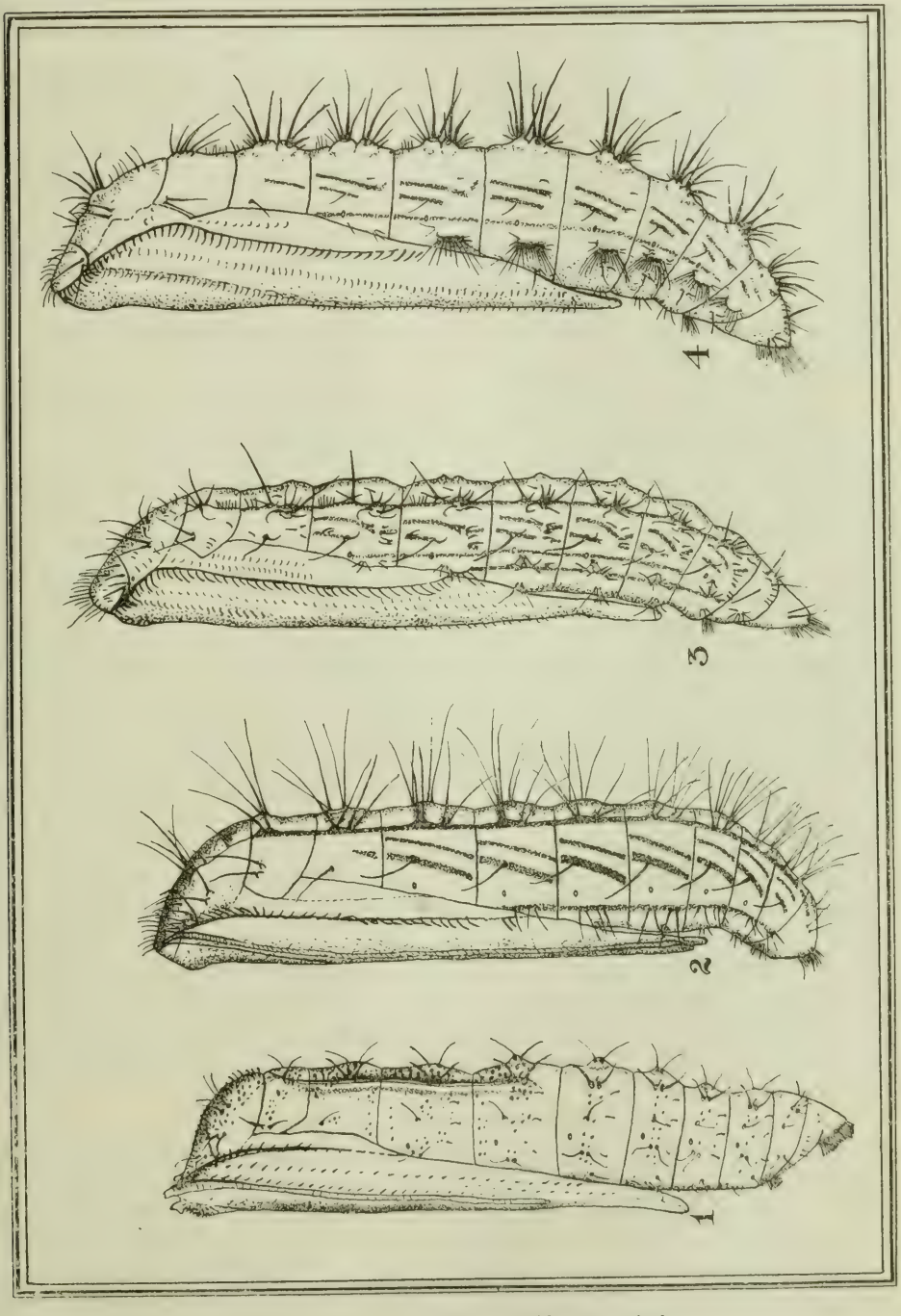


Fig. 1.—Pupa of *Trichoptilus lobidactylus* Fitch.
Fig. 2.— " " *Pterophorus homodactylus* Wlk.
Fig. 3.— " " *Pterophorus elliotti* Fern.
Fig. 4.— " " *Pterophorus eupatorii* Fern.

directly posterior to this group. Tubercle III shows two long central setæ, two minute posterior ones and three longer anterior ones; tubercle IV has four long central hairs and six or seven shorter ones arranged in a crescent around the edge; three short hairs are present on a level with the abdominal spiracle. On the abdominal segments tubercle I bears one long, shiny, smooth, central seta, three anterior shorter ones and one posterior one, very minute; tubercle II is represented by a central, long hair, two shorter posterior ones, pointing backward, and one very short anterior hair; tubercle III bears the same number of setæ as tubercle I; tubercle IV+V shows four long central hairs and about seven shorter ones, arranged in a semicircle around the ventral portion of the tubercle; posterior to this group two short hairs, pointing backward, probably represent tubercle IIIb; tubercle VI is a large one with about twelve hairs of which several are long; several hairs at the base of the prolegs represent tubercle VII. Length 14 mm.

Pupa (Fig. 3).—Very similar to that of *homodactylus*, green with the same pale ochreous markings; the white hairs from the tubercles are, however, shorter and more numerous, the abdominal segments contain a short white centrodorsal hair, midway between tubercles I, and the wing cases, besides the lateral fringe of fine hair, bear several additional rows of still shorter hair; the sheaths of the two posterior pairs of legs are also of equal length. On the first three abdominal segments tubercle I is preceded by a patch of small, white secondary hair, and on these same segments it bears one long central white hair, one anterior shorter hair and a single very short posterior one; on the remaining abdominal segments both the secondary hairs and the anterior tubercular hair are absent. Tubercle II is distinctly laterad to I, is large and bears a long, central, white hair, and five shorter hairs arranged around the circumference; dorsad to tubercle II is a single short hair and laterad to same tubercle, situated in the downward angle of the first pale lateral line, are two small white hairs, one directed forward, the other backward; below these again are two further short hairs on a line with tubercle III; this tubercle is situated on the second lateral line and bears one long hair pointing forward and one short hair directed backward; anterior to III on the first three abdominal segments are two short hairs. Below the spiracle and slightly posterior to same is a small tubercle with three short white hairs (?IIIb) and below this on the flange IV+V appears as a large crescentic tubercle with about eight long white hairs. Three short hairs, well below the flange, apparently represent tubercle VI. The thoracic segments show the usual modifications as well as considerable secondary hair on the posterior dorsal portion of each segment.

Pterophorus eupatorii Fern.

Larva (full-grown).—Head pale reddish ochre. Body pale green, becoming dorsally broadly suffused with purple-red when fully developed; a narrow ochreous dorsal stripe slightly broken centrally on each segment by a triangular green dot; traces of a broad pale subdorsal band crossing tubercles I and II; a narrow lateral line midway between tubercles I and III, bent downward posteriorly; a broken spiracular line. The principal setæ from tubercles I–III are blackish, very slightly spiculate, long and subequal. On the abdominal segments tubercles I and II are in line, contiguous, each with two long black setæ, the former in addition bearing two shorter anterior hairs, the latter with

two similar posterior ones and two very minute ones situated one posteriorly and one anteriorly. Tubercle III bears two long black setæ and one or two short white hairs. Behind the spiracle on the posterior margin of the segment is a minute white hair. Tubercle IV+V bears five long central white hairs and about the same number of shorter ones arranged as a rosette around the central hairs; two short white hairs directed backward are found posterior to this tubercle; VI is very similar in arrangement of setæ to IV+V and VII is as usual represented by several hairs at base of prolegs. On the prothorax a fringe of white hairs overhangs the head; behind this is a row of five black hairs and behind this row again are six black hairs arising from three tubercles, the middle one of which is centro-dorsal. On the meso- and metathoracic segments tubercle I+II bears five long black hairs, and two or three short anterior white ones; posterior to this group are two short white hairs arising from a small tubercle; tubercle III has two long black hairs and several shorter white ones. Length 13 mm.

Dr. Dyar's statement (Psyche, VIII, p. 250) that *eupatorii* larvæ feed on the underside of the leaf, concealed, whereas *elliotti* larvæ feed exposed on the upper side, was not verified by my observations; both species may be taken on either the upper or underside of the leaf, a favourite place being among the terminal half-opened leaf-buds.

Pupa (Fig. 4).—Apple green with purple-red suffusion each side of a pale centro-dorsal stripe; the lateral portions below the subdorsal ridge prominently purple-red with two oblique pale lateral lines and a similar spiracular one. Subdorsal and subspiracular flanges well-developed. Wing sheaths with lateral fringe of hair and further rows of short hair along the antennal and leg sheaths as in *elliotti*. Tubercles I and II on abdominal segments each with five or six finely spiculate white hairs, arranged more or less longitudinally, the central hair being longest. Dorsad to tubercle II is a single minute hair; on the first three abdominal segments dorsally is a small tuft of short hair anterior to tubercle I. Tubercle III, situated on anterior portion of the lower lateral stripe, bears only a single short white seta; posterior to it are two short hairs near rear portion of segment and arranged in line parallel to the segmental incision. Tubercle IV+V, situated on the lateral flange, is prominent, with about twelve long white spiculate hairs, and immediately anterior to it and close to the spiracle are two minute hairs arising from a small tubercle. Tubercles VI and VII are each represented by a couple of short hairs. The thoracic segments show the usual modifications in respect to the number of tubercular setæ.

THE HOUSE CENTIPEDE IN CANADA.

With reference to the records of the House Centipede in Canada, published in Can. Ent., Vol. LII, p. 8, the following may be of interest. While living on King St., in London, Ont., we had occasion to renovate a part of the house which had been used as a "back kitchen." This brought to light specimens of the House Centipede in large numbers, and I killed more than a hundred of them. Some were pinned in a box and shown to Dr. Bethune, the rooms of the Entomological Society at that time being in London. No special notes were made as the occurrence was not thought to be unusual.

A. C. Baker.

SOME RECORDS OF CANADIAN MYRIOPODS.

BY RALPH V. CHAMBERLIN,
Cambridge, Mass.

These notes are based upon a small collection of chilopods and diplopods chiefly from the region of Ottawa and Quebec City, Canada, made by Mr. Frits Johansen and by him sent to me for identification. The collection is especially interesting in containing representatives of two European diplopods not previously known to occur in America, *Blaniulus guttulatus* and *Julus fallax*. It seems desirable to place on record this first known appearance of these forms on this side of the Atlantic, occasion being also taken to list the other species represented in the collection. All specimens were collected in 1919.

Diplopoda.

1. **Polydesmus moniliaris** Koch.

This is a comparatively common form in the eastern United States northward from Pennsylvania through New York and New England. In the collection are two specimens from Ottawa, and one from Quebec City.

2. **Polydesmus serratus** Say.

A species abundant in the United States in the eastern portion and westward to the Mississippi valley. Six specimens, adult males and females, were taken at Ottawa.

3. **Blaniulus guttulatus** Bosc.

This interesting julid occurs throughout Europe, but is most abundant in the western parts, as in France, Belgium and Germany. In those countries it has been regarded as an injurious form, attacking various vegetables such as beans, potatoes, beets, cucumbers and gourds.* Numerous specimens of this form were taken at Quebec City in Sept., 1919.

4. **Julus coeruleocinctus** Wood.

This species is abundant from Pennsylvania northward through New York and New England. In New York particularly it has frequently been accused or suspected of damaging vegetable crops. It is represented in the collection by specimens from Ottawa and Quebec City.

5. **Julus fallax** Meinert.

One adult female of this species was taken at Ottawa. It is a common European form, well-known both upon the continent and in England and Ireland. It has also made its way by ship as far as New Zealand, from where I have a number of specimens.

6. **Parajulus canadensis** Newport.

One specimen from Ottawa. Described originally from Canada, this species has also been found to occur widely in the northeastern United States.

7. **Parajulus venustus** Wood.

In the collection is a male from Alexander Bay, Thousand Islands, N.Y., taken Sept. 1, 1919. It is somewhat darker than is usual in the more typical specimens from the middle western United States, and the gonopods are also slightly variant.

*Cf. Latzel, Die Myriopoden der Ost.-Ung. Monarchis, pt. 2, 1884, p. 253, and J. Ritzema Bos, Tierische Schadlinge and Nutzlinge, 1891, p. 663.

CHILOPODA.

8. **Linotaenia chionophila** Wood.

One specimen from Ottawa. This is one of the most common North American chilopods, abounding particularly in the northern sections. It is common in Alaska and the Pribiloff Is., etc. It is, I believe, not separable from the common European *Linotaenia acuminatus* Leach, the latter name having the priority, but it seems best not to merge the two for the present.

9. **Lithobius forficatus** Linné.

Two specimens from Ottawa. This is common in Europe as well as in North America. It occurs across the northern United States as far as the Sierra Nevada Mts.; but does not occur at present on the Pacific coast.

10. **Sonibius politus** McNeil.

An immature female from Ottawa and an adult male from Quebec City. Previously known from the north-central United States.

11. **Sigibius puritanus** Chamberlin.

One specimen from Quebec City. Common in New England.

12. **Bothropolys multidentatus** Newport.

One specimen from Alexander Bay, Thousand Islands, N.Y. A form common throughout the eastern section of the United States.

A NEW SPECIES OF TYPHLOCYBA (HEMIPTERA HEMOPTERA, TYPHLOCYBIDÆ).

BY J. R. MALLOCH,
Urbana, Ill.

The type of the species described herein is in the collection of the State Natural History Survey of Illinois.

Typhlocyba appendiculata, sp. n.

Male and Female.—Whitish testaceous; greenish or yellowish testaceous in life. Elytra with a moderately large, poorly defined brownish or fuscous spot in each of the cells basad of the cross nervures except the costal cell, and sometimes with a brown streak along the anterior margin of the clavus on its basal half. Body unmarked.

Male.—Hypopygium similar to that of *querci* Fitch, but the two elongate ventral processes are more attenuated at apices and each has a short, thorn-like lateral tooth some distance from apex which is directed laterad.

Female.—Apex of sheath of ovipositor not blackened.

Last ventral segment transverse apically.

Length 3.5 mm. to apices of elytra.

Type, male and allotype, Elizabeth, Ill., July 8, 1917. Paratype, male, Urbana, Ill., July 17, 1916, on oak. Collected by the writer.

This species closely resembles *querci* Fitch, but the spots on the elytra are larger and less clearly defined than in typical *querci*, the male hypopygium of the latter lacks the lateral tooth, and the apex of the sheath of the ovipositor in the female of *querci* is deep black.

DR. C. GORDON HEWITT.

It is with the most profound regret that we have to record the death of Dr. C. Gordon Hewitt, Dominion Entomologist, who died at Ottawa on February 29, 1920, of pneumonia, following a brief, but very severe attack of influenza. He had been attending the meetings of the Conservation Commission in Montreal, and was taken ill on the day of his return to Ottawa, February 20.

By his death Canada has lost one of her ablest men of science, and the Department of Agriculture a most valuable servant, through whose wide knowledge of economic zoology, farsighted judgment and great administrative ability the Dominion Entomological Service has developed to a remarkable extent in its scope and activities since his appointment as Dominion Entomologist in 1909.

An account of Dr. Hewitt's life and work, and a list of his publications, will appear in our next issue.

ENTOMOLOGICAL BRANCH DIVISION OF FOREST INSECTS.

Mr. Ralph Hopping, in charge of forest insect investigations in British Columbia for the Division of Forest Insects, is supervising control operations in the beetle-infested yellow pine of the Cold-water valley and the adjoining district west of Merritt and Canford, B.C. The work is undertaken in co-operation with the Prov. Forest Branch of British Columbia, the Dominion Forest Branch and local lumber companies. The control methods include modified logging operations, the salvage of the timber when this is feasible, and the burning of the slash. Mr. Hopping is having excellent success in organizing this important work, and we entertain great hopes that a large body of fine timber will be saved thereby.

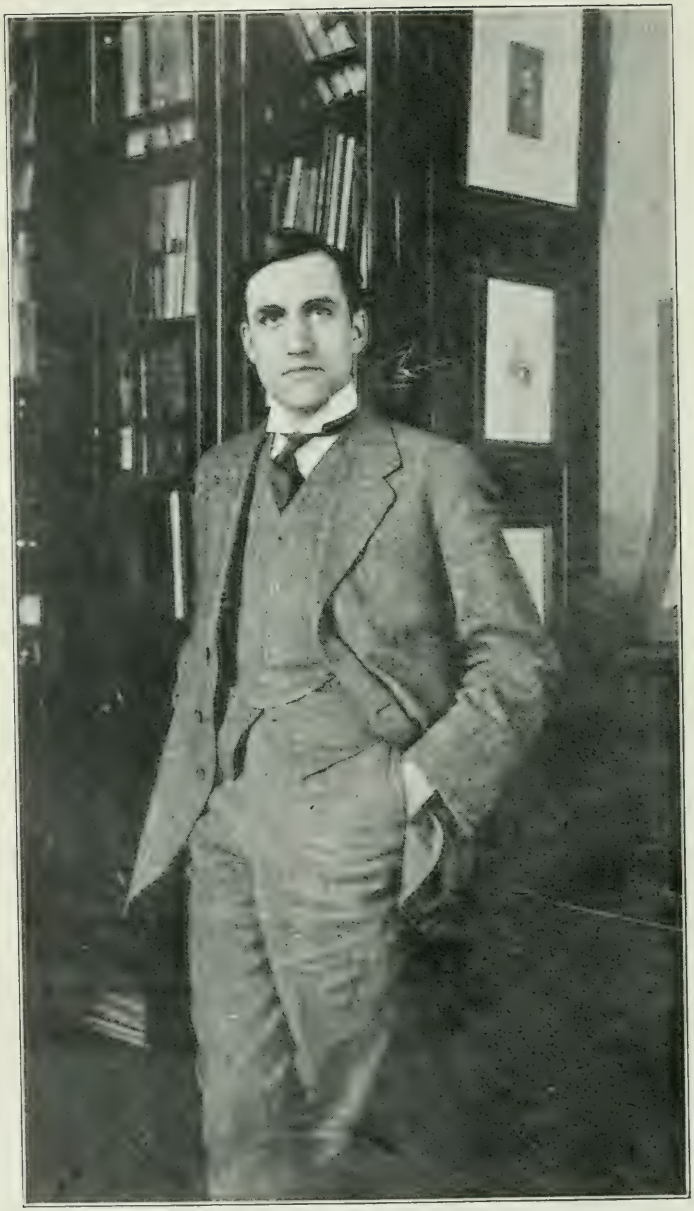
CORRECTION OF TWO GENERIC NAMES IN COLEOPTERA AND HYMENOPTERA.

In the Proceedings of the United States National Museum, Vol. 56, p. 139, et sequa, the writer made premature use of the generic name *Coleomegilla*, its proper publication in another journal having been delayed and finally omitted. The name should be credited to Dr. T. D. A. Cockerell, who supplied the writer with the following note in September, 1918: "Mr. Timberlake asks concerning the name in which I have had in manuscript since 1906 for the genus typified by *Megilla maculata* DeGeer, the name *Megilla* being preoccupied. It is *Coleomegilla*, and if we adopt it the species becomes *Coleomegilla maculata*." (Signed) T. D. A. Cockerell.

On page 190 of the same Proceedings the writer proposed the new genus *Brethesia* for a South American Encyrtid. This name is preoccupied by *Brethesia* Schrottky, and *Brethesiella* is here proposed to take its place, with *Brethesia latifrons* as type, the two included species becoming *Brethesiella latifrons* and *abnormicornis*.

P. H. Timberlake.

Mailed April 30th, 1920.



C. Gordon Hewitt,

The Canadian Entomologist

VOL. LII. LONDON, MAY, 1920. No. 5

CHARLES GORDON HEWITT.

In the death of Charles Gordon Hewitt, Dominion Entomologist and Consulting Zoologist, the biological sciences have lost a leader of exceptional ability. Not only was he held in the highest esteem by his colleagues of the Dominion Entomological Service, but entomologists generally the world over appreciated his brilliant attainments and marked executive ability. Although eminent in entomology his studies were by no means confined to this science. A broad study of economic zoology from the national standpoint occupied a large share of his thoughts particularly during the last four or five years of his life.

During his eleven years of office he developed the Dominion Entomological Service from a very small division, with one assistant and a stenographer, attached to the Experimental Farms Branch, to an important separate Branch of the Department of Agriculture. This development of the Entomological Branch was his most important achievement and the organization he perfected will remain a tribute to his great ability and zeal. The broad development of the Entomological Branch is instanced in the establishment of important Divisions at Ottawa, such as the Division of Field Crop and Garden Insects, the Division of Forest Insects, the Division of Foreign Pests Suppression, and the Division of Systematic Entomology, all under the immediate direction of highly-qualified Chiefs. In addition to these divisions of the work special officers have been given charge of such lines of study as Natural Control Investigations, Insecticide Investigations, and Stored Product Insect Investigations. In the various provinces too, field or regional laboratories have been established with trained entomologists in charge, who study local problems and disseminate information of value to agriculturists, horticulturists, lumbermen and others.

In 1909, Dr. Hewitt recognized the importance of legislation to prevent the introduction or spreading of insects, pests and diseases destructive to vegetation, and as a result Parliament passed the Destructive Insect and Pest Act in May, 1910. Under the regulations of this Act inspectors were appointed to deal with the threatened spread of the brown tail moth in the Maritime provinces, and provisions were made for the prohibition, fumigation or inspection of nursery stock at definite ports of entry. In addition to the brown tail scouting work, which he developed in co-operation with the provinces of Nova Scotia and New Brunswick, he also arranged for the collection in Massachusetts and establishment in eastern Canada of thousands of parasitic and predaceous enemies of the brown tail and gipsy moths. Dr. Hewitt was keenly interested in medical entomology and accomplished much useful work on problems related to the house-fly, mosquitoes, ticks and other animals which spread disease.

He was the author of important books and memoirs. His chief published work is the well-known book on the house-fly of which there were two editions. A smaller book on the same subject appeared later as one of the Cambridge

Manuals of Science and Literature. His departmental publications consist of a series of annual reports (1910-1916), bulletins, and circulars, chief among the latter of which are those dealing with the Honey Bee and the Large Larch Sawfly. Very recently he completed an important work on the conservation of the wild life of Canada, the manuscript for which is now ready for the press. The publication in 1919 of the various parts of an important volume on the insects collected by the Canadian Arctic Expedition, 1913-1918, was brought about under his direction.

Dr. Hewitt's reputation was by no means confined to Canada. In addition to a wide connection among scientific workers in England his outstanding abilities were soon recognized by entomologists in the United States, where economic entomology particularly has reached such a high development. In the year 1913 he was honoured by being elected a Fellow of the Entomological Society of America. In 1915 he was elected President of the American Association of Economic Entomologists. In Canada, in 1913, he accepted the Presidency of the Entomological Society of Ontario and in the same year was elected a Fellow of the Royal Society of Canada. In the following year he was appointed Honorary treasurer of the latter society, which office he held at the time of his death. He was a Fellow of the Entomological Society of London, England; a corresponding member of the Zoological Society of London and Honorary Fellow of the Royal Society for the Protection of Birds, London, England. He was a recognized student of wild life preservation and rendered valued service in the capacity of Secretary of the Advisory Board on Wild Life Protection. In March, 1918, he was elected President of the Ottawa Field-Naturalists' Club for the year 1918-19.

The gold medal of the Royal Society for the Protection of Birds was presented to Dr. Hewitt on March 12th, 1918, in grateful recognition of successful efforts in furthering the treaty between Canada and the United States for the protection of migratory birds.

A short time before his death he was chosen as the first President of the recently organized Institute of Professional Civil Servants. In addition he was President of the Ottawa Boys Home, an ardent supporter of the Boy Scout movement and a Councillor of the Ottawa Humane Society.

Dr. Hewitt was born near Macclesfield, England, on February 23rd, 1885. He was the son of Thomas Henry Hewitt and of his wife Rachel Frost. He received his early education at the King Edward VI Grammar School, Macclesfield, afterwards entering Manchester University, from which institution he received the following degrees: B. Sc. in 1902; M. Sc. in 1903, D. Sc. in 1909. He obtained first-class honours in Zoology at Manchester University, and was university prize man and scholar. In 1902 he was appointed by his alma mater Assistant Lecturer in Zoology, and in 1904-9 occupied the position of Lecturer in Economic Zoology. In 1909 he left England for Canada, having received the appointment of Dominion Entomologist. In 1916, his title was changed to that of Dominion Entomologist and Consulting Zoologist.

On October 11, 1911, Dr. Hewitt was married at Canning, N. S., to Elizabeth Borden, daughter of Surgeon General Sir Frederick Borden, K. C. M. G., Minister of Militia and Defence from 1896 to 1911.

Dr. Hewitt's eminence as a scientist and administrator was widely recognized. As an ardent student of wild life he was deeply interested in the development of game reserves, bird sanctuaries and all plans for the protection of wild life. The versatility of his interests in science, literature, art, music, and social welfare, combined with the charm of his fine character, had endeared him to many personal friends. His remarkable ability and well directed ambitions enabled him to accomplish more in the thirty-five years he lived than is compassed by most men in a long lifetime.

Dr. Hewitt had attended the meetings of the Commission of Conservation, at Montreal, on February 18th and 19th, at which he presented an important paper on "Fur Bearing Animals, their Economic Significance and Future."

Soon after his return to Ottawa on the 20th he was taken seriously ill with influenza; this soon developed into pleural pneumonia and he died about 11 p.m., on February 29, 1920.

The following resolution was passed at a recent meeting of the Council of the Entomological Society of Ontario.

"The Council of the Entomological Society of Ontario have learnt with extreme regret of the unexpected death of Dr. C. Gordon Hewitt, a former President of the Society, and Dominion Entomologist, and desire to place on record their high appreciation of his eminence in this branch of Science and of the notable work that he carried on by establishing field laboratories with capable managers in all the Provinces of the Dominion, in addition to the activities which he directed at the central office in Ottawa. They feel that the Society and Entomological Science in Canada have sustained a great loss which can hardly be over-estimated. Their sorrow in this bereavement is shared by a large number of Dr. Hewitt's friends in the United States as well as by all those who were associated with him in this country.

They wish to convey to Mrs. Hewitt their tribute of sympathy with her in the great loss that she has sustained and their high appreciation of her late husband as a leader and friend."

The senate of his alma mater passed the following resolution:

"The members of the senate desire to express their deep regret at the death of Dr. Charles Gordon Hewitt, formerly a student, graduate scholar, and lecturer in the University. He attained to great distinction by his researches in Entomology and by his great administrative abilities as chief entomologist in the Dominion of Canada.

They feel that by his early death a career of great distinction has been prematurely closed. They desire that a copy of this resolution be sent to his widow and to his father."

ARTHUR GIBSON,

J. M. SWAINE.

THE WRITINGS OF THE LATE C. GORDON HEWITT.

COMPILED BY C. B. HUTCHINGS.
Ottawa, Ont.

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POPULAR AND PRACTICAL ENTOMOLOGY.

The Imported Currant Worm.

BY L. CAESAR AND G. GARLICK,
Guelph, Ontario.

Pteronus ribesii Scop.

As nearly everybody who is at all familiar with currants and gooseberries has seen the imported currant worm, no description of the insect referred to will be necessary other than to state that it is the common bluish-green caterpillar with black head and numerous black spots on the body, commonly found feeding upon the foliage of gooseberries and some kinds of currants.

It is not our intention in this article to give a full account of the life-history and habits of the insect, but rather to draw attention to some points of interest and value discovered in a study made by the junior author for the senior at Burlington, Ontario, in the year 1919.

Host Plants.—The first point of interest to which we would call attention is that of host plants. In reading over the literature, especially books on Economic Entomology, one finds such statements as "The imported currant worm feeds upon currants and gooseberries" without stating definitely whether there are any exceptions, or "It feeds upon all kinds of currants and gooseberries." Our experiments show that such statements are inaccurate, for in no case have we been able to see any proof that it will feed upon black currant foliage. In the field, we occasionally found eggs upon black currant leaves, but in no case was there any sign of feeding. In cages, larvæ could not be forced by any means in our power to feed upon such foliage and further, the adults could not even be induced to lay eggs upon black currant leaves, though they readily laid upon the leaves of red currants. Moreover, growers informed us that they had never seen any injury to black currants by this species. We believe, therefore, that there is practically no doubt that black currants are immune and that the host plants are red and white currants and gooseberries. Whether there are any species of gooseberries immune or not, we have not yet been able to discover.

Time of appearance of adults in spring.—Before beginning our study we supposed that adults never appeared until the leaves were fairly well expanded, hence it was a surprise to find females present in large numbers in April and laying eggs before the largest leaves were the size of a ten-cent piece, and when the majority of the buds had just burst.

Parthenogenesis.—By cage experiments it was discovered that eggs were often laid by unmated females, and that these hatched just as well as fertilized eggs; in fact, in the later broods the females avoided the males as far as possible and appeared to lay more eggs when unmated. The adults derived from these unfertilized eggs were, in every case, males. This shows, therefore, that though mating is not necessary for the hatching of eggs, it is necessary for the perpetuation of the race.

Length of pre-oviposition period.—In the case of most of our common insects, a period of several days elapses from the time the adults appear until eggs are laid. The imported currant worm and several other allied saw-flies are exceptions to this. In the case of the former insect, oviposition begins in a

few hours after the emergence of the adults. In one instance where careful record was made of the time, the period was only one hour and five minutes.

Where eggs are laid.—The spring adults with very few exceptions lay their eggs in a chain-like arrangement along the main ribs or veins on the under surface of the leaves, the leaves chosen being almost always situated in the central, and lower part of the bush. Females of later generations are not so particular where they lay their eggs and sometimes place them almost indiscriminately over the leaves. This choosing in spring of the central part of the plant for oviposition is from the standpoint of control an important matter; because, when the eggs are hatched the young larvæ feed on the leaves nearby, eating at first little round holes in them and later devouring the whole leaf. They continue to feed gregariously in the central part of the bush until they are half grown, or even more. When the foliage is dense they have often eaten most of the leaves in this part of the bush before any but a close observer would notice that they are present. Accordingly, when they desert the central area and disperse over the outer leaves, they quickly do a very great deal of damage to the plant, especially as they feed ravenously and continue to eat all day long. Hence the fruit grower who delays spraying until he sees the insects at work on the outer leaves is likely to be late to kill them before they completely strip his plants.

Number of broods a year.—It is usually stated that there are only two broods. Our experiments however, show that in 1919 there was a regular spring brood followed by a partial second and a partial third brood, the latter two over-lapping greatly. The second brood of larvæ began to hatch from the eggs about a week before red currants were ripe, and hatching continued for fully a month. The third brood began to hatch a little more than two weeks after the fruit ripened. Adults which produced this brood continued to emerge in cages up into September. Fully half of the larvæ from the first brood remained in their cocoons throughout the year and did not transform into pupæ and adults to produce a second brood. The same thing was true of larvæ of the second brood.

Fortunately the second and third broods appear to be of little importance, for from some not clearly demonstrated reason, the great majority of the larvæ of these two broods died soon after hatching. Therefore, by destroying the first brood but little fear may be felt from the second and third.

Natural methods of control.—Two kinds of parasites were discovered, one a Braconid and the other a Cynipid. In addition to this numerous larvæ and eggs were destroyed by Aphis lions and ladybird larvæ. Another factor in control is the heat of the soil, which destroys many larvæ that fall upon it accidentally or when seeking pupation quarters; and as mentioned above, large numbers of larvæ of the second brood for some unknown reason died soon after hatching. In addition to this may be mentioned the fact that unfertilized eggs produced only males.

Artificial methods of control.—There is scarcely any insect easier to poison than this. We discovered that as small a quantity as one-half pound of arsenate of lead paste in 40 gallons of water would kill small larvæ. Our recommendations are, however, to spray the bushes thoroughly with from one to two pounds of arsenate of lead paste, or from one-half to one pound of arsenate

of lead powder in 40 gallons of water. Apply the liquid as soon as the leaves are well developed on currants or just before the red currants come into bloom, and take special precautions to spray thoroughly the central and lower part of the bush; because this is where the young larvæ feed for a week or more after hatching. If Bordeaux mixture is used, arsenate of lime, a little weaker than either of the above strengths of arsenate of lead, may be used, or Paris green may be substituted at the strength of not more than one-quarter of an ounce to 40 gallons of the Bordeaux. Usually one good spraying is quite sufficient. If a second one is given, it should be about eight or ten days after the first, or soon after the red currants are well set.

It may be worth mentioning in closing that Bordeaux mixture is a most valuable fungicide for currants, both red and black, and has the effect of preventing the foliage from dropping prematurely. In this respect it is much superior to lime-sulphur or the soda-sulphur compounds, and also to any of the sulphur or Bordeaux dusts that the writers are familiar with.

EAST KOOTENAY DIPTERA. TIPULIDÆ—I.

BY C. B. D. GARRETT,
Cranbrook, B.C.

Under the admirable leadership of Dr. C. P. Alexander I have been doing some work on the Kootenay Tipulidæ. The work has but started, but small as it is, the list of specimens is of some interest, for it contains three forms hitherto unknown from Canada. These are *Dicranoptycha sobrina* Will., *Tipula dorsolineata* Doane and *Rhaphidolabis neomexicana* Al. The last is interesting, having been previously taken only at two localities in Colorado and one in New Mexico. The capture of *Stygeropis fuscipennis* Lw. also upsets the view that it is only a late season flyer, since in the Kootenays it is on the wing from May 7th until July 14th.

It is unfortunate that most of the captures have been females only, as these are, in many cases, difficult to determine, but later males will probably be taken, and doubtful names verified or corrected.

The list as it stands is as follows:—

Dicranomyia concinna Will. possibly *D. venusta* Bergroth, April 28.....3,500 feet
" sp. near *halterata* O.S. ♀ only. Sept. 26.....3,500 "
Dicranoptycha sobrina O.S. ♀ only. June 23, '19. July 3 to Aug. 20, '18.....3,500 "
Geranomyia canadensis Western. Dead.....6,000 "
Helobia hybrida Mg. May 2.....3,500 "
Limnophila ultima O.S. Oct. 20.....3,500 "
Nephrotoma erythrophrys Will. June 26.....3,500 "
Rhaphidolabis neomexicana Al. July 21.....3,500 "
Stygeropis fuscipennis Lw. May 7 to 20, July 14.....4,000 "
Tipula angustipennis Lw. May 8 to June 16.....3,500 "
" *dorsolineata* Doane. Aug. 5 to Sept. 4.....4,000 "
" sp. probably *fragilina* Al. ♀ only. 29 Sept. to Oct. 29.....3,500 "
" sp. close to *subtenuicornis* Doane. July 20.....3,500 "
" sp. probably *tenaria* Lw. May 22.....3,200 "
" sp. females only. Aug. 25.....3,500 "
" sp. females only. May 29.....3,500 "

NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART IX.

BY CHARLES P. ALEXANDER.
Urbana, Illinois.

The majority of the species considered in this part were secured by Dr. P. W. Claassen in Estes Park, Colorado. Others were taken by Messrs. Frison, Lindley and McAtee. The writer is indebted to all the above gentlemen for the privilege of studying this material. Unless stated otherwise, the types of the species are preserved in the writer's collection.

Elliptera coloradensis, new species.

General coloration dark brown, the mesonotal praescutum brownish black; wings grayish subhyaline, the cord and outer end of cell *1st* M^2 indistinctly seamed with brownish gray; cell *1st* M^2 closed; Sc^2 located before the origin of *Rs*.

Female.—Length 8 mm.; wing 10 mm.

Rostrum and palpi dark brown. Antennæ dark brown, the flagellar segments oval. Head dark brown.

Pronotum obscure brownish yellow. Mesonotal praescútum obscure yellow with three broad, brownish black stripes that are practically confluent, restricting the ground-colour to the humeral region and the lateral margins; scutum yellow, each lobe with two confluent brownish black areas; scutellum obscure yellow; postnotum dark brown. Pleura brownish yellow, the mesepisternum darker; mesosternum between the fore and middle coxæ brownish black. Halteres pale, the knobs a little darkened. Legs with the coxæ and trochanters yellow; remainder of the legs dark brown, the femora paler basally. Wings grayish subhyaline, the costal region indistinctly more yellowish; cord and outer end of cell *1st* M^2 narrowly seamed with brownish gray; veins dark brown; stigma lacking. Venation: *Sc* rather short, Sc^1 ending about opposite two-thirds the length of *Rs*, Sc^2 located before the origin of *Rs; R* pale at the apex; R^1 bent suddenly cephalad at the tip so that cell R^1 is widened at its outer end; deflection of R^{4+5} slightly angulated; *r-m* oblique in position; cell *1st* M^2 closed, a little shorter than vein M^{1+2} beyond it; basal deflection of Cu^1 just before the fork of *M*.

Abdomen dark brown, the pleural integuments paler, the genital segment paler. Ovipositor with the valves elongate.

Habitat.—Colorado.

Holotype—♀, Fall River, Estes Park, August 24, 1919, (P. W. Claassen).

Erioptera (Erioptera) subseptemtrionis, new species.

Male.—Length 4.5 mm.; wing 6 mm.

Similar to *E. septemtrionis* O. S., differing as follows:

General coloration dark brown, the lateral margins of the praescutum and two stripes on the thoracic pleura paler. Legs dark brown, the femoral bases paler. Wings darker with the stigma much more distinct; veins straighter, M^{1+2}, M^3 and Cu^1 showing little tendency to bend toward the wing-tip as in *E. septemtrionis*. Male hypopygium with the spine of the inner pleural appendage much longer than in *septemtrionis*, appressed to the appendage and almost straight; the blade of this appendage is flattened and without a concave depression formed by a short, lateral ridge as in *septemtrionis*.

Habitat.—Colorado.

Holotype—♂, Fall River, Estes Park, August 24, 1919, (P. W. Claassen).
Paratopotypes—2 ♂'s.

Dicranota montana, new species.

General coloration gray, the mesonotal praescutum with three brown stripes; wings pale brown, the stigma dark brown; a faint brown cloud at *r-m;* cell M^1 present; cell *1st* M^2 open by the atrophy of *m*.

Male.—Length 9.3 mm.; wing 9.2 mm.

Rostrum and palpi dark brown. Antennæ rather elongate, dark brown, the flagellar segments somewhat incrassated on their inner face. Head dark brown, presumably gray pruinose in dry specimens.

Mesonotal praescutum gray with three conspicuous, dark brown stripes; scutal lobes dark brown; remainder of the mesonotum and the pleura dark brown. Halteres pale, the knobs slightly darker. Legs with the coxæ dark brown basally, paler brown apically; trochanters brownish yellow; remainder of the legs dark brown, the femoral bases more yellowish. Wings with a pale brownish tinge; stigma oval, dark brown; a faint brownish cloud at the deflection of R^5 and *r-m;* veins dark brown. Venation: Sc^1 ending opposite *r; Rs* short, strongly arcuated, angulated or weakly spurred beyond the base; R^{2+3+4} equal to or shorter than *r-m;* R^{2+3} before *r* longer than this cross-vein; outer deflection of R^2 close to the tip of R^1; deflection of R^5 short to very short; cell M^1 present; cell *1st* M^2 open by the atrophy of *m*.

Abdomen dark brown, the pleural integument pale with a linear brown mark opposite each segment. Male hypopygium with the pleurites short and stout, the outer angles slightly produced; pleural appendage bifid, the outer arm short, fleshy, with numerous setæ, the inner arm longer, flattened into a yellowish chitinized blade. Penis-guard a broad depressed structure, the caudal margin produced into three short points.

Habitat.—Colorado.

Holotype—♂, Fall River, Estes Park, August 24, 1919, (P. W. Claassen).
Paratopotypes—3 ♂'s.

Nephrotoma sphagnicola, new species.

Close to *N. incurva* (Lw.); occipital spot broadly subtriangular; mesonotal scutum trivittate, there being a narrow black, median stripe in addition to the marks on the scutal lobes; thoracic pleura indistinctly spotted with reddish brown.

Female.—Length 13.5–14 mm.; wing 10.5–11.8 mm

Frontal prolongation of the head yellow, the dorso-median line black; nasus long, black; palpi dull yellow, the last segment passing into brownish. Antennæ with the first segment brown, more reddish beneath; second segment pale; flagellum black 'Head broad, bright orange, the occipital mark broadly rounded or subtriangular, rather indistinct; a small brown spot on either side of the vertical tubercle, adjoining the inner margin of the eye; genæ tinged wth dark brown.

Pronotum dull yellow. Mesonotum pale orange-yellow with three black stripes, the median stripe very broad in front, narrowed behind; lateral stripes short, straight, not connected with the rounded velvety spot laterad of their anterior ends; scutum trivittate with black, a distinct, black, median vitta, in addition to the triangular black areas on the scutal lobes; scutellum brownish,

paler on the sides, with a narrow, blackish median vitta; postnotum orange-yellow, the median area brownish, broader on the posterior portion Pleura yellow, indistinctly spotted with reddish brown; a narrow, almost black line immediately before the base of the halteres. Legs with the coxæ dull yellow, indistinctly brown at the base; trochanters dull yellow; femora dull brownish yellow, the tips darker; tibiæ brown, the tips narrowly dark brown; tarsi dark brown. Wings with a faint yellowish tinge, the costal area but little brighter; stigma dark brown; a narrow brown seam along the cord, passing along both branches of *Cu* to the wing-margin; tip of the wing narrowly darkened; a pale vitreous area in cell *1st* R^1 before the stigma. Venation: cell M^1 broadly sessile; *m-cu* present, located just before the fork of *M*.

Abdominal tergites obscure yellow; segment one with a black basal ring; other segments with the caudal margin blackened, this broadest on segments two to four, more or less produced cephalad medially so as to be almost continuous along the dorso-median line; the black caudal margin is narrow and less distinct on the succeeding segments; lateral margins of the segments broadly dark brown; sternites yellow. Ovipositor with the tergal valves very long and slender, acute, greatly exceeding the sternal valves.

Habitat.—Illinois.

Holotype—♀, Antioch, Lake Co., June 5, 1919, (T. H. Frison).

Paratopotype—♀.

Type in the collection of the Illinois Natural History Survey.

This species was submitted to Dr. Dietz for his expert opinion and he agrees that the fly is undescribed, most closely related to *N. incurva* (Lw.), from which it may be told by the diagnostic characters given above. The types were secured by Mr. Frison in a sphagnum bog, associated with other species of Tipulidæ of northern affinities (*Limnophila poetica* O.S., *Tipula serta* Lw., *Tipula senega* Alex., and others).

Tipula claasseni, new species.

Head and thorax brownish black; wings grayish subhyaline, the base and subcostal cell yellowish; abdominal tergites orange-yellow, trivittate with dark brown; ovipositor with the valves short and fleshy.

Female.—Length 11.8–12 mm.; wing 13–14 mm.

Frontal prolongation of the head rather short, narrowly dark brown above, obscure yellowish on the sides; nasus distinct. Antennæ short, dark brown, the second scapal segment a little paler. Head dark brownish black, paler on the sides of the vertex and on the postgenæ.

Thorax, in alcohol, dark brownish black, in dry specimens possibly pruinose, the dorso-pleural membranes obscure yellow. Halteres light brown. Legs with the coxæ and trochanters brownish black; femora reddish, narrowly tipped with dark brown; tibiæ brown, the tips slightly darker; tarsi brownish black. Wings grayish subhyaline, the base strongly yellow; cells *C* and, especially, *Sc*, light yellow; stigma small, brown; a conspicuous obliterative area before the stigma in cell *1st* R^1 and another in the end of cell *R* that crosses vein M^{1+2} and almost fills cell *1st* M^2. Venation: *Rs* long, longer than R^2 but shorter than R^3; R^{2+3} a little longer than *r-m;* deflection of R^{4+5} short or practically obliterated, the *r-m* cross-vein correspondingly lengthened; cell *1st* M^2 small, pentagonal; petiole of cell M^1 a little longer than *m; m-cu* short.

Abdominal tergites orange-yellow with three conspicuous brownish black stripes, on the subterminal segments the entire sclerites are darkened; basal sternites yellow, the others passing into brown. Ovipositor with all the valves short and blunt, somewhat as in the *bicornis* and *collaris* groups of the genus.

Habitat.—Colorado.

Holotype—♀, Lawn Lake, Estes Park, altitude 11,000 feet, August 27, 1919, (P. W. Claassen).

Paratopotype—♀.

This curious fly might well be mistaken for a male, but the specimens are undoubtedly females. Somewhat similar structures are found in the *collaris* and *bicornis* groups. The species is respectfully dedicated to the collector, Dr. P. W. Claassen.

SUMMARY OF WOOD'S MYRIAPODA PAPERS.

BY HORACE GUNTHROP,
Washburn College, Topeka, Kansas.

We note by Science[1] that Dr. Horatio C. Wood, emeritus professor of materia medica, pharmacy and general therapeutics in the Medical School of the University of Pennsylvania, died January 3, last, at the age of 79. Before taking up the study of medicine, he was interested in natural history, and was a worker in the Academy of Natural Sciences, publishing several papers in the Insecta, and nine on the closely related group Myriapoda. In these latter we have by far the most extensive work done in this country on this group by any individual up to his time, and these papers must rank as the foundation on which all work on the Myriapoda has since been built.

The first of these papers (1)[2] was a preliminary report on the genus *Scolopendra*, and describes four species as new. The next year he issued a general catalogue of the Chilopoda (2) in which two new genera and twenty-nine new species are included. In the following year three papers appeared, the first on the Polydesmidæ (3) includes the descriptions of ten new species, the second one on the Julidæ (4), fourteen new species, and the last (5), two new genera and the same number of species. In 1865 appeared his "Myriapoda of North America" (6), in which there are eighteen genera and ninety-two species listed, three of the latter being classed as new. This is an extensive monograph illustrated with numerous cuts and three plates, two of which are coloured. It discusses the external structure, and brings the systematic side of the subject up to date, reviewing the work of all earlier writers with the notable exceptions of C. L. Koch and Saussure, whose writings must have been unknown to Wood, judging from omissions and the resulting synonyms. The same year he published the one paper he wrote on foreign material (7), describing a new genus (*Oligaspis*) and species (*O. puncticeps*) from Port Natal, and a single new species (*Glomeris bicolor*) from Hong Kong. His work on the group closed with two short papers published in 1867, the first one (8) describing four new species from Texas, and the second (9), six new species from Illinois and California. He retained his interest in insects for some time after this, but after 1875 cellular botany and medicine filled all his time.

1. Vol. 51:106-107. Ja 30, 1920.
2. Numbers in parenthesis refer to bibliography at end.

In all, Dr Wood described four new genera (*Bothropolys*, *Opisthemega*, *Octoglena* and *Brachycybe*) from the United States, and one foreign genus, and a total of seventy-two species from this country, and two from elsewhere, making a grand total of five genera and seventy-four species of Myriapoda to be placed to his credit.

The following is a list of the new species described by Wood from the United States:—

Chilopoda—

Cermatia linceci.
Lithobius bilabiatus.
" *paucidens.*
Bothropolys nobilis.
" *xanti.*
" *bipunctatus.*
Scolopendra castaneiceps.
" *polymorpha.*
" *parva.*
" *byssina.*
" *longipes.*
" *copeana.*
" *bispinipes.*
Cryptops asperipes.
Opisthemega postica.
" *spinicauda.*
Scolopocryptops gracilis.
" *spinicauda.*
" *lanatipes.*
Geophilus cephalicus.
" *brevicornis.*
" *laevis.*
" *bipuncticeps.*
Mecistocephalus quadratus.
" *fulvus.*
" *melanonotus.*
" *limatus.*
Strigamia gracilis.
" *inermis.*
" *bothriopus.*
" *bidens.*
" *laevipes.*
" *taeniopsis.*
" *maculaticeps.*
" *laticeps.*
" *cephalica.*
" *parviceps.*
" *epileptica.*
" *chionophila.*
" *walkeri.*

Diplopoda—

Octoglena bivirgata.
Brachycybe lecontii.
Julus venustus.
" *pilosiscuta.*
" *oregonensis.*
" *immaculatus.*
" *canaliculatus.*
" *laqueatus.*
" *milesii.*
" *cinereifrons.*
" *caeruleocinctus.*
" *hortensis.*
" *virgatus.*
" *caesius.*
" *diversifrons.*
Spirobolus spinigerus.
" *uncigerus.*
" *angusticeps.*
Spirostrephon caesioannulatus.
Polydesmus trimaculatus.
" *corrugatus.*
" *bifidus.*
" *crassicutis.*
" *cerasinus.*
" *eruca.*
" *placidus.*
" *floridus* (var?)
" *haydenianus.*
" *hispidipes.*
" *setiger.*
" *impurus.*
" *dissectus.*

Bibliography of Horatio C. Wood.

(1) 1861. Descriptions of new species of *Scolopendra* in the collection of the Academy. Proc. Phila. Acad., pp. 10–15.

(2) 1863. On the Chilopoda of North America, with catalogue of all the specimens in the collection of the Smithsonian Institution. Jour. Phila. Acad., n. s., Vol. V, pp. 5–52.

(3) 1864. Descriptions of new species of North American Polydesmidæ. Proc. Phila. Acad., pp. 6–10.

(4) 1864. Description of new species of North American Iulidæ. Proc. Phila. Acad., pp. 10–15.

(5) 1864. Description of new genera and species of North American Myriapoda. Proc. Phila. Acad., pp. 186–187.

(6) 1865. On the Myriapoda of North America. Trans. Amer. Phil. Soc., Vol. XIII, pp. 137–248, pls. I–III.

(7) 1865. New Polyzoniidæ, Gervais. Proc. Phila. Acad., pp. 172–173.

(8) 1867. Descriptions of new species of Texan Myriapoda. Proc. Phila. Acad., pp. 42–44.

(9) 1867. Notes on a collection of California Myriapoda, with descriptions of new Eastern species. Proc. Phila. Acad., pp. 127–130.

NOTES ON SOME MOSQUITOES NEW TO CANADA.

BY ERIC HEARLE,
Guelph, Ont.

Psorophora sayi Dyar and Knab.

This beautiful insect has not previously been recorded from Canada, although it is reported from the Atlantic and Gulf states, the Mississippi Valley, Cuba and the Bahamas.

The single specimen obtained by the writer was taken near Jordan, Ontario, on August 3rd, 1916. It was in woods, attempting to bite at 8.30 in the morning. With it were a number of *Aedes canadensis*.

This is a very distinctive mosquito; in the sunlight most of the scales give off vivid purple reflections. The hind tibiæ and some of the hind tarsal segments have many erect, dark purple scales which give a brush-like appearance to these parts. The apices of the hind legs are white: the two distal tarsal segments and part of the preceding one being entirely white-scaled. The abdomen is dark-scaled, the scales having violet reflections. At the apex of each segment, on each side, there is a lateral yellow triangular patch. The venter is yellow-scaled.

Aedes triseriatus Say.

There is no previous Canadian record of this very interesting little mosquito. Howard, Dyar and Knab give its distribution as the United States east of the Rocky Mountains.

The writer found the species to be a fairly common one in woods in Southern Ontario. Females only were taken and these were found to bite fiercely during the day, but collections made after nightfall gave no specimens. Quickness of movement and a highly-strung sense of danger characterizes the species which is a very illusive one.

The writer's specimens were taken at Jordan, Ontario, on August 3rd, 1916. Dr. E. M. Walker kindly loaned for examination specimens of males and larvæ of *triseriatus* taken by him at De Grassi Point, Ontario. The larvæ were obtained from a tree-hole on July 4th, 1917, and the males bear the date June 23, 1917. These were reared from larvæ taken from the same tree-hole.

Aedes triseriatus is a small black and white mosquito in which the markings are very characteristic. The mesonotum has a broad band of dark brown scales running from base to apex and covering the central half. The sides are pure-white scaled. The abdomen is black-scaled dorsally, except for white spots laterally at the base of each segment. The venter is white-scaled, except for apical black bands on the posterior segments. The legs are black and the wings are clothed with black scales.

Aedes aldrichi Dyar and Knab.

While investigating the mosquito problem of the Fraser Valley, B.C. during 1919, the writer found *Aedes aldrichi* to be the dominant mosquito of that district. Previous to this it had been known only from Montana and Idaho.

The extensive development of this species in the Fraser Valley is apparently dependant upon the fluctuation of the river. In years of high freshet, the cotton-wood bottom lands around the river become flooded and *aldrichi* is extremely abundant. The adults bite very viciously and are so small that they can penetrate ordinary screening with comparative ease.

Swarming of males was observed at six p.m. on July 12th, 1919, at Dewdney, B.C. Four or five dozen individuals were hovering in a swarm three or four feet from the ground. The swarm was composed almost entirely of males and was in a place well protected by willow growth.

This small grayish *Aedes* has the thorax clothed with yellowish-gray to pale straw-coloured scales. There is a broad median divided stripe of dark brown scales, and two short lateral markings of the same colour. The abdomen is black, with crisp white basal bands narrowed in the centre and broadening laterally in the posterior segments to form broad triangular patches. The legs are black, and the wings are entirely black-scaled.

Specimens were taken at Mission, B.C., between June 13th and August 3rd. They were found throughout the valley from Hope to Ruskin.

Anopheles quadrimaculatus Say.

It is surprising that there are no previous Canadian records of this mosquito, as the writer found it to be fairly common in some parts of Southern Ontario. Specimens were taken at St. Catharines, Ontario, on August 24, 1916, and at Jordan, Ontario, on August 4, 1916. At the latter place *quadrimaculatus* was very abundant. It was not found at Guelph, where *occidentalis* is the common Anopheline.

A. quadrimaculatus is a gray-brown species in which the brown mesonotum is clothed with yellowish hair scales: the abdomen is grayish-brown and has many silky, pale hairs. The legs, proboscis and palpi are uniformly dark-scaled, save for yellow scales at the knees and the apices of the tibiæ. The wings are marked with four dark spots, these being at the forks of the second and fourth veins, at the base of the second vein and at the cross-veins. The wing fringe is uniformly dark-scaled.

Anopheles occidentalis and *A. walkeri* somewhat resemble this species, but the former has a yellow coppery patch on the wing fringe, at the apex; and the latter has less distinct black spots on the wings and has white rings on the palpi.

REMOVING POLLEN FROM BEES.

It is well known to all persons who have made a collection of bees that a large proportion of specimens in some genera—notably *Andrenidæ* and *Megachilidæ*—are so heavily loaded with pollen that their beauty as cabinet specimens is much impaired, and also that some of the characters which need to be examined in order to identify them properly are covered and concealed.

Last season I experimented to find some practical and easy way to remove the pollen without injury to the specimens, and I succeeded so well that I thought that some of your readers would like to know about it.

I take a wide-mouthed bottle holding some five or six ounces and fill it about two-thirds full of gasoline, drop the bees in and cork tightly and shake vigorously for two or three minutes, then pour off the liquid into another bottle and empty the bees out on to a sheet of blotting paper. In a few minutes the gasoline will all evaporate and leave the bees perfectly clean. When wholly dried out they should be examined with a lens, and if not clean give them another bath of fresh gasoline This second bath will rarely be necessary if thoroughly done the first time In case some very shaggy species should not look fluffy enough, a little brushing with a small, soft paint brush will completely restore the natural appearance Some pollens are more difficult than others to remove That of viburnum is the worst I have seen yet, but it will come off. I am sure that any one who will give this plan a thorough trial will be more than satisfied. Old dried specimens cannot be cleaned.

N.B.—Do not fear to shake vigorously. You cannot injure them, and it is necessary to shake well in order to rinse them completely.

E. J. Smith, Sherborn, Mass.

CONCERNING THE DISTRIBUTION OF NORTH AMERICAN. CICADELLIDÆ (HEMIP.).

BY GEO. W. BARBER,
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Some time ago a study was pursued to determine what relation the distribution of N. A. Cicadellidæ had to the life zones of N. A. fauna. It was soon found, however, that under our present knowledge of the distribution of the insects of this family, such a study would lead to considerable confusion, and it was, therefore, discontinued for the present.

Certain information did develop, however, concerning the distribution of the Cicadellidæ, and it is here presented as perhaps adding something to our conception of this family:

Undoubtedly some localities in the distribution of the species have been overlooked, but an endeavor has been made to know the distribution of each species so far as it has been recorded in literature.

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The Cicadellidæ is represented in America north of Mexico, by 70 genera through which are distributed some 773 species now held to be distinct. On the whole, very little has been done to determine the fauna of any given locality. Several lists, however, have been published and for at least six states the family has been collected extensively and recorded. There may be mentioned the New York and Maine lists by Prof. Osborn, the Tennessee list by De Long, the Wisconsin list by Saunders and De Long, the Missouri list by Gibson and Cogan, and the South Carolina list of Lathrop. In addition to these more extensive lists there have been several minor lists, which need not be mentioned here.

Of the 773 recognized species, some 294 have been recorded from but one locality, the locality of the type and apparently never recovered. The localities of these follow:

"Am. Sept."	1	Tenn	19
Boreal Am	1	Wisc	12
Carolina	1	Iowa	4
Maine	5	Arkansas	1
N. H	1	Texas	9
N. Y	3	Kansas	3
N. J	3	Nevada	3
Md	2	Utah	6
D. C	3	Colorado	62
Va	2	N. Mexico	6
N. C	1	Arizona	15
S. C	6	Calif	70
Ga	3	Washington	4
Fla	20	Oregon	4
Penn	4	Canada	3
Ohio	2	Manitoba	1
Ill	5	Vanc. Isd	1
Mich	1	Alaska	5
Kentucky	1	Greenland	1

Total—294.

The number of species in addition to the above list that have been recorded from certain of the General Geographical regions may be summed up in the following list:

Generally distributed throughout the U. S. and Canada	32
Generally distributed throughout the U. S	24
Generally through Atlantic States	33
Generally through Northern States	72
Occurring generally East of the Rocky Mountains	134
" " through the Southern States	52
" " " " Middle Western States or great plain region.	25
" " West of the Miss. River	5
" " through Rocky Mountain Region	60
" " in the South West	27
" " in the North West	3
" " in the Pacific slope	10

The number of species that have been recorded from the several states, territories and provinces is here enumerated:

Maine	151	La	8
N. H	74	Minn	8
Vermont	6	N. D	8
Mass	62	S. D	12
R. I	5	Nebr	39
Conn	14	Kans	107
N. Y	209	Okla	3
Penn	143	Texas	73
N. J	123	N. Mex	41
Del	1	Ariz	70
Md	46	Colo	268
D. C	65	Wyo	7
Va	17	Mont	7
N. C	112	Utah	61
S. C	121	Idaho	3
Ga	40	Nevada	8
Fla	128	Oregon	11
Ohio	89	Wash	21
W. Va	2	Calif	178
Kentucky	15	Mexico	15
Tenn	242	Quebec	94
Ala	12	Ontario	121
Miss	40	Alaska	11
Ind	11	Manitoba	6
Ill	63	Vanc. Isd	19
Wisc	208	Brit. Col	43
Mich	43	Greenland	1
Iowa	161	Nova Scotia	4
Mo	155	Newfoundland	1
Ark	9		

From the figures presented above, the most striking fact that will be apparent is not the number of species found in any one region, but the meagre information that we have concerning the Cicadellid fauna of the majority of the states and provinces. The value of state and even local lists is here quite apparent, through the service that they render in extending the known distribution of species.

It is quite evident that certain sections accommodate a considerably larger number of species of Cicadellidæ than others whose climatic conditions are less varied, but it may be estimated that nearly all of the states should give from 150 to over 250 species. Considering the meagre collecting that appears to have been done in certain parts of our territory the total number of living species of this group will undoubtedly be found to be greatly in excess of one thousand.

A NEW LEAF-CUTTING BEE FROM THE HAWAIIAN ISLANDS.

BY T. D. A. COCKERELL,
Boulder, Colorado.

Some time ago Mr. P. H. Timberlake requested me to examine the status of a *megachile* now common at Honolulu, but considered to have been introduced from some place not determined. It was very much like *M. palmarum* Perkins, also common in the Hawaiian Islands, but evidently distinct. A few days ago he sent me a long series of this bee, and after prolonged study and comparisons, I can only regard it as undescribed. It belongs to the subgenus *Eutricharæa* Thomson (*Paramegachile* Friese), and is very much like the European *M. argentate* Fabr.* Bees of this type are very widely distributed over the world, so I confidently expected to locate the Hawaiian insect in Japan, China, the Phillipines, Australia, or elsewhere. It is very like *M. erimæ* Mosc., from New Guinea, but has dusky wings. Superficially, it might be taken for any one of about a dozen species, but it agrees with none. It may have come from one of the other Pacific islands, as Samoa or Tohitic, and it is perhaps significant that a Tahihan *Lithurgus* has been introduced into Oahu. It is a fact, however, that endemic species of this group of *megachile* occur in very remote places, and there is no apparent reason why they should not exist in the Hawaiian Islands. *M. palmarum* is said by Perkins to occur probably in all the islands, and it is quite possible that the new species has existed on one of the islands, though perhaps more recently brought to Oahu.

Megachile timberlakei, n. sp.

Male (Type).—Length 8–8.5 mm.; black, parallel-sided, with large head, simple antennæ, spined anterior coxæ and simple anterior tarsi. Face and front densely covered with light yellow to creamy-white hair; mandibles black, hairy at base; antennæ slender, black; vertex with long dark fuscous hair; cheeks above with light yellowish hair, but below it is long and pure white; hair on thorax above and upper part of sides ochreous, varying to paler, beneath pure white; mesothorax and scutellum dull and very finely punctured; a band of tomentum along hind margin of scutellum; tegulæ black; wings dusky with black nervures; legs black, with white hair, yellowish on inner side of basitarsi first four abdominal segments with pale yellowish hair-bands, and narrow curved bands in the depressions; upper surface of sixth segment densely covered with white tomentum; apical keel emarginate, with irregular denticles on each side; fifth ventral segment and anterior femora in front more or less pallid, brownish.

Female.—Length 10–10.5 mm.; supraclypeal area and middle of clypeus exposed; much dark fuscous hair on mesothorax and scutellum; ventral scopa pure white, black on last segment.

Type male, Kaimulai, Oahu (*Timberlake*). Also from Honolulu and Makua, Oahu.

Compared with *M. palmarum* received from Dr. Perkins, the male differs by the denticulate and less deeply emarginate keel of sixth abdominal segment, the more oblique sub-basal bands of abdomen, and the fulvous or subochraceous

*In Friese's Die Bienen Europa's there is a curious error in the key, in which the scopa of *M. argentata* is said to be entirely white. It is black on the last segment, as is correctly stated in Friese's description.

tint of the hair on thorax above, with a distinct band behind scutellum and a fainter one in front. The hind tibiæ of *palmarum* are larger and more robust, and much less densely white—hairy. In the female, the pure white ventral scope, black on last segment, is distinctive. A *palmarum* received from Dr. Perkins has the scopa pale reddish, black on last segment; one from Mr. Timberlake has it creamy-white, black on last segment and sides of penultimate. In his description, Perkins states that the hair of the female is cinereous, with little or no fulvous tinge, and is sparse on clypeus. This agrees with *palmarum* as here recognized, but his account of the ventral scopa is more suggestive of *timberlakei*. Possibly he had the two females mixed, but his type must be considered to be the male, which is described at length. The clypeus in *timberlakei* has a large and dense brush of inwardly-directed hairs on each side, but there is little of this in *palmarum*.

A PLEA FOR DEFINITIVENESS.

I should like to bring to the attention of contributors to the Canadian Entomologist a matter which is worthy of consideration, especially to the systematist. In looking over many numbers of the "Entomologist" I have noted numerous headings such as "A Canadian Trigonalys." The point which I would like to bring out is that, to the student who is not familiar with the family to which the genus Trigonalys belongs, nothing is conveyed: that is, he is utterly "at sea" as to the family discussed. Would not the interest in these various genera and families be greatly increased if authors were to give not only the genus and family, but also the name of the superfamily and order under discussion. A great service would be rendered students taking up a family for study if they could quickly locate all the literature on a family, and a great many synonymous names might be avoided. After all, it must be remembered that the aim of every author is to place his findings in such a position that they will be readily available to others, and his work is judged largely by his ability to do this. The above example was selected at random, and it happens that it is but a mild example of hundreds of cases. A specialist should bear in mind that everyone is not up-to-date in his particular field, but a great deal more interest would be taken if greater definition were given.

C. Howard Curran.

Mailed May 25th, 1920.

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POPULAR AND PRACTICAL ENTOMOLOGY.

Fragments in the Life-Habits of Manitoba Insects—II.

by NORMAN CRIDDLE,
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In a Province such as Manitoba, which is comparatively new agriculturally, we are continually experiencing insect outbreaks involving species not hitherto known to be obnoxious. The insects concerned are always native to the country and frequently owe their increase to the development of agriculture, which has been the means of placing new food supplies at their disposal. In other instances the insects have doubtless multiplied abnormally in the past but owing to the lack of observers at such times, their abundance apparently did not attract attention. Two such outbreaks have occurred in Manitoba within the last few years and though my notes relating to them are by no means complete they seem, however, sufficient to indicate the general habits of the insects concerned, and have, therefore, been brought together for publication under the above heading.

The Brome-grass Cutworm.

(*Trachea fanitima cerivana* Smith).

The larvæ of this insect are unobstrusive in their general habits and might pass unnoticed were it not for the fact that they gather in the sheaves of Brome-grass (*B. enermis*) to hide. The caterpillars are naturally shaken out of these sheaves at harvest time and in consequence attract attention as they crawl about the bottoms of the racks when the grass is being threshed.

The Brome-grass Cutworm is a surface feeder which hides under, or in, any convenient object, such as hay, etc., during the day and comes out to feed at night. It attacks the young shoots, or tender leaves, of various succulent grasses but shows a marked preference for brome-grass. The larvæ first attract attention about the middle of September when they gather into the grass sheaves which have been cut for seed purposes. Apparently the insects enter the sheaves with the object of securing shelter rather than for hibernating purposes, as they still continue to feed at night, though not very extensively. By the middle of October the caterpillars have attained a similar size and have finished feeding for the year. At this date, most of them leave the sheaves that are standing upright but they may still be found beneath those lying down or under any other conveniently placed object. They are now often partly buried in the soil showing that the time of hibernation has arrived.

In the spring, larvæ still remain in the vicinity of their hiding places and appear to eat comparatively little. They are, however, active by the time farming operations commence and continue to feed until they pupate in early May. A description of the caterpillars as they are met with in autumn follows :

Length 26 mm. Head light brown notably reticulated with darker brown; on either side of the median suture is a rather wide dark brown irregular band extending from the vertex to near tip of clypeus the latter being margined with the same shade of colour; ocelli and mandibles black. Body, ground colour dull pinkish-white, closely marbled above with blackish-brown, giving the whole body a dark appearance; dorsal stripe narrow, pinkish-white, distinct on all segments; lateral stripe similar to dorsal one but less distinct. Stigmatal band pale, rather ill defined; spiracles yellowish, black rimmed. Thoracic shield brown divided by dorsal and lateral stripes. Tubercles indistinctly blackish, I, II, III and IV of similar size, IV immediately behind the centre of spiracle on segment six, tubercle V smaller than IV close to spiracle and in a line with its upper side; the other tubercles similar in size to III. Anal plate pinkish-brown. Thoracic feet yellowish-brown; prolegs concolorous with venter; crotches reddish.

Moths commenced to emerge in captivity on June 5 and the last to appear in my cages was on June 7. Outside, they have been collected from the beginning to the end of that month but were commonest during the first two weeks. The moths are of the usual cutworm size with pale gray primaries showing a brownish area on the middle portion; the head and thorax are also gray while the abdomen and secondaries are dull brown.

The economic importance of the Brome-grass Cutworm lies chiefly in its relation to the production of the grass upon which it feeds. Observation, combined with reports from threshermen in various parts of the province, show that the insect occurs in large numbers over a wide area. The moths have also been taken in Saskatchewan and Alberta. It is, therefore, probable that the larvæ will be found to occur in equal numbers on the brome-grass fields of Saskatchewan and perhaps in Alberta also. In Manitoba the insects are usually so abundant in the sheaves at threshing time that they cause considerable annoyance by getting into the seed while the racks frequently present a mass of crawling caterpillars. When one views a field of brome-grass inhabited by these insects, however, the actual damage done to the plants appears to be remarkably small considering the number of larvæ present. This is probably due to the vigorous growth of the grass after harvest which thus largely overcomes the insect's attack upon it. The species is not, therefore, a serious menace at the present time though the damage it does is probably much in excess of the usual estimates. Should it increase to still greater numbers, however, the loss would have an important bearing on the pasture situation of the west, brome-grass being recognized as one of the most valuable fodder plants of that region.

We know of no actual means of suppressing this pest but the following suggestions might be of advantage in attempting its control:

(1) Plough affected fields in July and cultivate them later on to prevent further growth; thus starving the young caterpillars.

(2) Destroy the insects shaken into the racks.

(3) Feed brome-grass straw and burn the refuse around where the crop has been threshed. This will kill a large number of the cutworms which drop to the ground while the sheaves are being handled and which hibernate in the vicinity amid the chaff, etc., scattered round by the thrashing operations.

The Early Aspen-Leaf Curler.

(*Proteopteryx oregonana* Wlshm.)

The years 1917-18 were noteworthy, in an entomological sense, owing to the abundance of three microlepidopterous leaf-curling larvæ all of which attacked aspen poplar, *Populus tremuloides*. One of these insects has already been dealt with,* while the habits of a second are described below.

The larval habits of the Early Aspen-leaf Curler are similar in many respects to those of other leaf-curling species but unlike the other two prevalent during the period mentioned above, complete their life the same season that they hatch from eggs, instead of hibernating, while the moths differ by emerging from over-wintering pupæ very early in the spring. In 1918, they were on the wing in millions by the end of March.

The moths are of a dull blackish-brown colour above, indistinctly barred with darker tints, the secondaries being lighter. They may be met with at any time during the day when they rise from the leaves as one walks through the woods. Usually, however, the time of greatest activity is towards evening, approximately an hour before sunset until dark. It is then that they rise in large swarms and fly backward and forward over the tops of the trees. This is when the air is still. A very light breeze, however, is sufficient to force them downward. It is due to the wind that they gather in the shelter of the woods and drop sufficiently close to the ground to be watched with ease. Observed under such circumstances they were seen to fly around the lower trees in a similar manner to their movement about the higher ones but in addition to the general habits on the wing they were also found to possess another one which consisted of alighting upon a twig a foot or more from its extremity and then running to the top where they would remain stationary for a few moments as if attempting to secure nourishment from the bud, after which they would arise again to join the flying swarm. The moths continued in their evening activities, whenever the atmosphere was sufficiently warm, for more than a week before oviposition commenced and remained in large congregations throughout most of the egg-laying period.

The eggs are flat, scale-like objects, of a dark clay-yellow and thus resemble very closely certain marks always present upon the twigs. They are usually deposited singly but occasionally three or more may be found slightly overlapping each other. In 1918, eggs were deposited from April 6 to approximately the 20th. They are always found upon the smaller twigs and there seems to be some attempt made to place them around the scars or buds where they are less detected. With calm weather most of the eggs are laid on the higher trees but otherwise they may be found comparatively close to the ground on quite small trees, or near the tips of the lower branches of larger ones. It is due to these habits that certain clumps of trees may be almost entirely defoliated later on, while others in the same neighborhood escape with comparatively small injury.

Larvæ usually begin to emerge towards the end of April and are numerous a few days later. When they first appear the caterpillars are somewhat flattened objects with a head exceeding the body in width. They are dull yellowish in colour, with a black head and dark but duller thoracic shield. The larvae become of normal cylindrical shape after moulting and change very little in colour

*The Agricultural Gazette of Canada, Vol. 5, No. 11, 1918.

throughout their further stages. When mature they may be briefly described as follows:

Length about 14 mm.; body dull white; head shining black; thoracic shield widely margined on sides and narrowly posteriorly with black; thoracic legs dull black; prolegs whitish. Tubercles large, flat, but difficult to define on account of the pale colour.

In 1918 the trees were still without leaves at the time the larvæ commenced to appear though here and there, odd buds had burst sufficiently to enable the young caterpillars to obtain a certain amount of food, a majority, however, being obliged to remain without it for some days longer. The spring of 1918, however, had been an abnormally early one and in consequence, induced an early hatching of the larvæ besides causing the leaves to appear before their usual time. Thus the larvæ had already commenced to curl the leaves when the weather suddenly changed from extreme heat to severe cold the effect being to kill the latter and in consequence entirely cut off the insects' food supply. The result was naturally disastrous to the caterpillars and caused a great many to die of starvation. It is possible that the mortality may have been due to cold also, but from the fact that large numbers of larvæ were observed crawling about in search of food afterwards, the evidence indicates that lack of it was the principal cause of death. The threatened devastation of the poplar leaves in 1918 was thus reduced, by the meteorological condition alone, to comparative insignificance though sufficient larvæ survived to provide various local outbreaks the following year.

In 1919, larvæ appeared soon after the poplars began to leaf out and by May 12 had curled 50 per cent. of the leaves on certain clumps of trees. The insects developed very quickly. By May 27 many had become fully mature and were dropping from the trees in large numbers. To observe the falling of the caterpillars when they are about to pupate, is a very interesting incident; the larvæ apparently prepare themselves for the drop by crawling to the edge of their shelter and fastening themselves firmly to the leaf by means of a silken thread. Here they remain until a breeze sweeps through the trees when the shaking causes them to loosen their hold and they come down in a regular shower, the web affording just enough check to prevent a direct fall. As the insects reach the dead herbage the rattle sounds not unlike that of a sudden shower of rain but so quickly the larvæ wriggle out of sight that unless careful watch is kept they are apt to entirely escape detection. These showers of caterpillars may continue intermittently for several hours there being an absolute lull in activity between the gusts of wind, though there is little doubt that they would let themselves down in any case should the weather remain calm. The larvæ at the time they drop, are quite devoid of internal colour matter such as that provided by food, and present a dull white appearance with a brownish head and a small patch of the same colour on the front portion of the sides of the thoracic shield.

Pupation takes place below the dead leaves usually a short distance in the soil. The pupal stage lasts from early June until the following spring, or approximately 10 months.

The parasitic enemies of the Early Aspen-leaf Curler are numerous but have not been studied. Of the predacious enemies there are a number. One large beetle, *Calosoma frigidum*, was met with everywhere and was observed to be active both by day and night. Running briskly up the trees or flying from branch to branch, it searched diligently for the leaf-curlers which it devoured with evident relish. Its larva is not a climber but is equally useful as it is able to seek out and devour the pupæ which are buried below the dead leaves. The increase of this Calosoma beetle has been very marked during the outbreak of leaf-curlers doubtless due to the abundance of caterpillars upon which it feeds.

Several birds have been observed to eat the leaf-curlers; these embrace the Rose-breasted Grossbeak, Red-eyed Vireo and Cedar Bird but the time of their activity in this regard is short owing to the fact that the caterpillars season has ended before many of the birds commence to nest. It is, therefore, those species which are passing through during migration that we can look to as being of most use as destroyers of the Early Aspen-leaf Curler.

A NEW TORTRICID MOTH FROM NOVA SCOTIA, (LEPIDOPTERA).

BY AUGUST BUSCK,
Washington, D. C.

Cacœcia hewittana, new species.

Labial palpi, face and head light reddish ochreous. Thorax light brown. The ground colour of the fore wings varies in different specimens from light ochreous, often with a reddish tint, to dark brown, and is faintly reticulated with thin dark brown transverse lines; a dark-brown, outwardly oblique, transverse fascia from before the middle of costa to just before tornus is normally attenuated on the upper part of the cell and broadens out towards the dorsal edge; a large dark brown triangular costal spot at apical third is sometimes more or less connected with the fascia; extreme apex and upper part of termen blackish brown; the males with a narrow costal fold from base to apical third. Hind wings dark fuscous with apex golden ochreous, cilia golden ochreous with a dark fuscous basal line paralliel to the edge of the wing. Undersides of both fore and hind wings light fuscous with the costal termen edges broadly golden ochreous. Abdomen dark fuscous with ochreous underside and anal tuft. Legs golden ochreous.

Alar expanse: 16-20 mm.

Habitat: Sydney, Nova Scotia, Canada.

Type and paratypes in National Collection of Insects, Ottawa, Canada, and in the United States National Museum, (Type No. 22667).

Described at the request of Mr. Arthur Gibson, from a large series which he bred from raspberry received from Mrs. S. J. Harrington.

Named in honour of the late Dr. C. Gordon Hewitt.

Species is typical of the genus and nearest to *Cacoecia fractivittana* Clemens but smaller, (especialy the females, there being no striking dissimilarity in the sexes as in Clemens species) and darker in colour. The male genitalia are typical for the genus, with well developed spoon-shaped uncus, hook-like gnathus, absence of socii, well-defined unarmed transtilla and short broad harps. The tegumen is noticeably narrower, the top of the harps more pointed and the aedoeagus more pointed than in *Cacoecia fractivittana* Clemens.

SOME NEW NORTH AMERICAN SAPROMYZIDÆ (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

Some of the species described herein have been in my possession for some years, while others were recently submitted for identification by Mr. W. L. McAtee, in connection with the preparation of a paper on the species occurring in the vicinity of Washington, D.C., and by Mr. C. W. Johnson. The location of the type specimens is stated in the paper.

Minettia punctifer, sp. n.

Female.—Testaceous yellow, shining, thoracic dorsum densely yellowish pruinescent. Antennæ and palpi yellow; frons opaque, paler on orbital stripes and ocellar triangle than on interfrontalia; ocellar spot black. Thoracic dorsum with a pale brown dot at base of each hair and bristle. Abdomen with a black spot in centre of each tergite from 2 to 5 inclusive and a smaller spot on each side of the apical two or three tergites. Legs pale. Wings clear.

Frons a little longer than wide, with two strong backwardly directed orbital bristles on each side; arista with very short hairs; parafacial and cheek very narrow. Thorax with three pairs of dorsocentrals, one pair of strong prescutellar acrostichals, and a moderately strong intra-alar bristle. Hind femur and hind tibia without preapical bristle. Last section of fourth vein about 1.75 as long as preceding section.

Length 2 mm.

Type.—Fort Lauderdale, Fla., February 18, 1919, (A. Wetmore). Type in collection of U. S. Bureau of Biological Survey.

Sapromyza nubilifera, sp. n.

Male and Female.—Testaceous yellow, shining. Both cross-veins broadly infuscated.

Similar in all respects to *nubila* Melander in cephalic and thoracic details, differing in the male only as follows: Apical sternite with a series of short black setulæ on apical margin, which are absent in *nubila;* hind tibia and hind metatarsus with long, fine hairs on anterior surface, which are absent in *nubila;* Hind femur in both sexes without fine hairs on antero- and postero-ventral surfaces, the latter especially lacking these, which are present in *nubila.*

Length 3.5–4.5 mm.

Type.—Male, and one male paratype, Monticello, Ill., June 21, 1914. Allotype, Monticello, Ill., June 28, 1914. Paratypes, two males, Mahomet, Ill., August 6, 1914; two males and two females, Urbana, Ill., June 17, 1916; one male and one female, same locality, June 20, 1915; one male and one female, same locality, June 23, 1916 (Hart and Malloch).

Type in collection of Illinois Natural History Survey.

Sapromyza fuscibasis, sp. n.

Male and Female.—Yellow testaceous, shining. Each wing with 6 brown spots as follows: on each cross-vein, at apices of veins 2, 3 and 4, and on last section of 3 beyond cross-vein; base of third vein dark brown. All hairs and bristles black.

Arista short-haired above and below; lateral facial hairs weak; ocellar and postvertical bristles strong. Thorax with 3 pairs of strong dorsocentrals and very strong acrostichals, of which two pairs are proximad of the anterior pair of dorsocentrals. Abdomen in male stout; eighth tergite with two curved downwardly projecting processes at apex of each lateral extension, one of them with numerous microscopic black points on apical half. Hind femora with or without a weak preapical antero-ventral bristle; hind tibia in male normal.

Length 3.75–4.25 mm.

Type.—Male and two male paratypes, White Heath, Ill., July 11, 1915, (J. R. Malloch). Allotype, and one male and two female paratypes, Summer, Ill., August 2, 1914, (C. A. Hart). Paratypes, one female, St. Joseph, Ill., June 27, 1915; one male, Dubois, Ill., August 8, 1917, (J. R. Malloch); one male, Urbana, Ill., September 15, 1891, (J. Marten); two females, Plummer's Island, Md., June 28, 1914, and September 13, 1914, (W. L. McAtee).

Type in collection of Illinois Natural History Survey.

Sapromyza (Sapromyzosoma) citreifrons, sp. n.

Male.—Pale yellowish testaceous, almost stramineous, the frons, and at times the entire head lemon yellow. Wings marked as in *fuscibasis*, but the spot at apex of second vein is almost indistinguishable, and the base of third vein is pale. Bristles on dorsum of head, thorax, and abdomen brown, the hairs and bristles on sides of head and thorax and on legs yellow.

Head very large, the frons slightly swollen, parafacial in profile wider than third antennal segment; arista with short hairs; cheek about half as high as eye, the marginal hairs long, curled. Thorax with 4 pairs of dorsocentrals which decrease very much in size anteriorly; acrostichals small but distinct, about 6 pairs, not carried proximad of the anterior dorsocentrals. Abdomen short, constricted at apex, when the hypopygium is concealed the basal portion, eighth tergite, appears spherical; lateral extension of eighth tergite with a short, broad, apically rounded terminal process. Bristles on fore coxæ and postero-ventral surface of fore femora remarkably long and slender; mid femur with a very long slender bristle at base on ventral surface; hind tibia normal.

Length 2.5–3 mm.

Type.—Savanna, Ill., June 13, 1917. Paratypes, Cobden, Ill., May 9, 1918, (J. R. Malloch). Five males.

Sapromyza occidentalis, sp. n.

Male and Female.—Similar to *fraterna* Loew and *notata* Fallen in colour, the entire body being yellowish testaceous including the legs, and each wing with 7 brown spots.

Differs from the above two species in having the thorax with 4 pairs of dorsocentral bristles, the acrostichals much weaker and regular in size, and the hind femur without a preapical antero-ventral bristle. The hypopygium of the male differs in structure from that of *fraterna*.

Length 3.5–4 mm.

Type.—Male, and allotype and five male paratypes Pasadena, Cal., (coll. Aldrich). One male paratype, Laguna Beach, southern California, (Baker).

Type in collection of Dr. Aldrich.

Sapromyza pernotata, sp. n.

Male.—Similar to *fraterna* in colour and markings.

Differs in structure of the male hypopygium from *fraterna*, the thoracic chaetotaxy being the same. The eighth tergite has the lateral extension with a short process the apex of which is produced in the form of a slightly forwardly directed sharp thorn at its anterior angle, while in *fraterna* this tergite has a broader process which has a backwardly directed, curved sharp thorn at apex anteriorly. The small furcate process mesad of the above process is differently shaped in the two species. In *fraterna* there are two subequal thorns, while in *pernotata* on is much larger than the other.

Length 4 mm.

Type and one male paratype.—Cedar Lake, Ill., August 4, 1906, in a tamarack bog.

Type in collection of Illinois State Natural History Survey.

Sapromyza imitatrix, sp. n.

This and the next species belong to the same group as *bispina* Loew, which contains species with the following characters: Entire body and legs yellowish testaceous, wings unmarked, the cross-veins usually darker than the others, but the adjoining membrane not infuscated; arista with short hairs; thorax with 4 pairs of strong dorsocentrals and well-developed acrostichals; hind tibia of male with soft erect hairs on antero- or postero-ventral surface or on both; and the apical abdominal sternite with two long slender processes.

Male.—Differs from *bispina* in having the processes of apical sternite almost uniform in width, rounded at apices; the hind femur with long, fine hairs on entire length of both antero- and postero-ventral surfaces, and the hind tibia with long, fine hairs from base to well beyond middle on postero-ventral surface, while the antero-ventral surface is bare.

Female.—Differs from *bispina* in having the prosternum bare, and the hind femur with a long setulose hair near apex on postero-ventral surface.

Length 4–4.5 mm.

Type.—Male, and one male paratype, Clementon, N. J., May 30, 1895. Allotype, Anglesea, N. J., July 19, 1891. Paratypes, one male, Riverton, N. J., July 7; one female, DaCosta, N. J., June 4, (C. W. Johnson).

Type in collection of C. W. Johnson.

Sapromyza fratercula, sp. n.

Male.—Differs from *imitatrix* in having the hind femur with very few sparse hairs on postero-ventral surface, and those on antero-ventral longer and stronger on apical half and almost absent on basal; the hind tibia with fewer hairs on postero-ventral surface and some at base on antero-ventral; the eighth tergite with a slight ridge on lateral extension posteriorly; and the small, median thorn at base of the large, slender forwardly directed hypopygial process furcate instead of simple.

Length 5 mm.

Type and two male paratypes, Powderville, Mont., June 15, 1916, (R. Kellogg and M. Hanna). Type in collection of U. S. Bureau of Biological Survey.

SOME NEW SPECIES OF LONCHÆIDÆ FROM AMERICA (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

The species described in this paper belong to the genus Lonchæa which contains a large number of forms which superficially resemble each other very closely, but which upon examination are easily separated in most cases by means of characters usually ignored by systematists. In the descriptions here presented I have introduced some of the most useful of those characters, and as I have in preparation a key to the species occurring in America and Canada, I have not made a lengthy comparison of allied forms in this paper, depending upon the publication of the key to make the relations clear.

Lonchæa aterrima, sp. n.

Male.—Glossy black, without any evident bluish tinge. Frons opaque black, upper orbits shining, subgranulose, not glossy; antennæ black. Wings slightly brownish, veins brown. Calyptræ brownish, fringes fuscous. Legs black, basal two or three tarsal segments yellowish. Halteres black.

Eyes bare; frons at vertex a little less than one-fifth of the head-width, narrower anteriorly; marginal and interfrontal hairs long, the latter in two series; frontal lunule bare; third antennal segment about 1.5 as long as wide; second segment of arista nearly twice as long as thick; hairs on cheek long, not dense. Thoracic bristles not very strong, those on scutellum not much more conspicuous than the numerous marginal hairs; two or three hairs at base of stigmatal bristle; pteropleura bare. Hind femur without any outstanding antero-ventral bristle near apex; hind tarsus with the basal segment slightly incrassated.

Female.—Frons broader than in male, at vertex one-third of the head-width, the interfrontalia with the hairs more irregularly arranged and more numerous; third antennal segment broader than in male. Ovipositor very distinctly broader than in any other described American species, acute at apex, the apical hairs very short.

Length 3.5–4 mm., exclusive of ovipositor.

Type, male, and allotype, Orono, Me., May 19, 1912, (H. M. Parshley). Paratypes, two females, Mt. Washington, N. H., July 4 and 6, 1914, alpine garden, and 2,500 feet altitude (C. W. Johnson). Type and allotype collection of Boston Society of Natural History.

This species belongs to the subgenus Earomyia.

Lonchæa hirta, sp. n.

Male.—Glossy black, thoracic dorsum with faint violet and blue reflections, abdomen distinctly bluish. Tarsi yellowish testaceous, apical two and part of third segment fuscous. Wings whitish, distinctly infuscated at bases, veins very pale, darkened at apices. Calyptræ brown, fringes fuscous. Halteres black.

Eyes with sparse, almost indistinguishable short hairs; frons at vertex about one-fourth of the head-width, narrowed anteriorly, with numerous long erect hairs, some hairs caudad of the orbital bristle; third antennal segment at least three times as long as its greatest width; cheek with dense, erect, stiff black hairs of a uniform length. Dorsum of thorax with longer and more dense hairs

than in other species; scutellum with numerous hairs on apical half of disc; several hairs at base of stigmatal bristle; pteropleura with one or two long hairs in centre. Abdomen more densely haired than in other species. Inner cross-vein below apex of auxiliary; last section of fourth vein distinctly sinuous. Hairs on posterior surface of mid and fore femora long and rather dense; hind femur with a series of fine hairs on antero-ventral surface but no bristles.

Length 4.5–5 mm.

Type.—Briggsville, North Adams, Mass., June 18, 1906. Paratypes, same locality as type, June 19, and North Adams, Mass., June 18 (C. W. Johnson). Three males. Type in collection of Boston Society of Natural History.

Lonchæa affinis, sp. n.

Male.—Similar to *hirta* in colour, the wings yellowish, with pale bases. Frons not so densely haired, the cheeks especially more sparsely haired; third antennal segment barely three times as long as its greatest width. Thorax and abdomen less densely haired than in *hirta;* pteropleura bare. Venation as in *hirta*, the last section of fourth vein not so noticeably sinuous.

Female.—Similar to the male in colour.

Eyes separated by about one-third of the head-width at vertex, slightly less anteriorly; frons shining, minutely granulose, with a slight carina in centre as in male; sometimes one or two hairs present caudad of the orbital bristle. Ovipositor with two exceptionally long hairs on upper side near apex. Inner cross-vein beyond apex of aulixiary vein.

Length 4–5 mm.

Type.—Male, Mt. Washington, N. H., Alpine Garden, July 4, 1914. Allotype, Glen House, N. H., June 13, 1916. Paratypes, male, Mt. Everest, Mass., June 27, male, North Adams, Mass., June 15; male, Bashbish Falls, Mass., June 28, 1912; female, South West Harbor, Me., July 13, 1918 (C. W. Johnson). Type in collection of Boston Society of Natural History.

Lonchæa ruficornis, sp. n.

Female.—Black, shining; thorax slightly, abdomen distinctly bluish. Antennæ rufous orange, third segment narrowly brownish on upper margin and apex. Wings clear, veins yellow. Legs black, tarsi yellowish testaceous, slightly infuscated on apical segment. Calyptræ white, fringes concolorous. Halteres black, stems yellowish.

Frons a little over one-third of the head-width, shining, but not glossy, the surface except the upper part of orbits with microscopic diagonal striæ; ocellar triangle glossy; anterior ocellus not caudad of orbital bristles; frontal hairs strong and numerous, absent from a large subtriangular area in front of ocelli; parafacials and cheeks microscopically diagonally striate, the cheeks with dense stiff uniform black hairs; third antennal segment about three times as long as broad. Thorax with short decumbent hairs, the bristles not long; several hairs at base of stigmatal bristle; pteropleura bare. Ovipositor stout, the preapical dorsal hairs short. Legs normal. Second costal division about one-eighth as long as first; last sections of veins 3 and 4 parallel.

Length 5 mm.

Type.—Savanna, Ill., June 14, 1917, (J. R. Malloch). Type in collection Illinois Natural History Survey.

Lonchæa angustitarsis, sp. n.

Female.—Black, glossy, with very faint bluish reflections. Frons shining, upper orbits and ocellar triangle glossy; antennæ black. Legs entirely black. Wings clear. Calyptræ brown, fringes fuscous. Halteres black.

Frons a little less than one-third of the head-width, microscopically granulose, with sparse hairs on the interfrontalia; orbital bristle proximad of the anterior ocellus; lunule with some hairs; third antennal segment about 2.5 as long as broad; cheek with moderately long, sparse setulose hairs; palpi not much broadened. Thoracic bristles much longer and stronger than the hairs; some hairs on margin of scutellum between the bristles; stigmatal bristle simple. Legs slender, the tarsi much more so than in allied species; hind femora without antero-ventral preapical bristle. Veins 3 and 4 parallel apically.

Length 3 mm.

Type.—Echo Lake, Mt. Desert Me., July 12, 1918, (C. W. Johnson). Type in collection of Boston Society of Natural History.

Lonchæa nigrociliata, sp. n.

Female.—Differs from the preceding species in having the tarsi yellowish testaceous, with the apical one or two segments fuscous, and the wings yellowish.

Frons slightly broader than in *angustitarsis*, subopaque, and with more numerous interfrontal hairs; frontal lunule bare; third antennal segment broad, its length about twice as great as its breadth; cheek as in preceding species. Legs stouter than in that species, the hind tarsi slightly thickened; hind femur without preapical antero-ventral bristle. Second costal division much shorter than in *angustitarsis*, the inner cross-vein but little beyond apex of auxiliary whereas in the other species it is almost below apex of first vein.

Length 3.5 mm.

Type.—South West Harbour, Me., July 11, 1918, (C. W. Johnson).

Lonchæa aberrans, sp. n.

Male and Female.—Similar in colour to *nigrociliata*.

Frons of male with two series of long hairs on centre of interfrontalia, of female with a few hairs in addition to the two series; frontal lunule bare; third antennal segment but little longer than broad, about 1.5 at most; cheek as in *nigrociliata*. Upper part of orbits microscopically diagonally striate, with a silky appearance which is quite different from the broader glossy orbits of *nigrociliata*. Thorax as in that species but usually there are no hairs between the apical scutellar bristles. Legs as in *nigrociliata*. Second costal division shorter than in that species, the inner cross-vein almost below apex of first. Ovipositor very slender, the apical hairs very short.

Length 3–3.5 mm.

Type.—Female, Parker, Ill., April 17, 1914, (Hart and Malloch). Allotype, Algonquin, Ill., May 4, 1895, (Nason). Paratypes, male, Carlinville, Ill., determined as *polita* Say by Williston, (C. Robertson); female, Spruce Brook, Newfoundland, August 8–12 (Amer. Mus. Nat. Hist.); one male and one female, reared from heads of bull thistle, Elphinstone, Man., collected July 27, 1906, emerged in laboratory February 25, 1907, (W. A. Burman). Type in collection of Illinois State Natural History Survey.

This and the preceding species belong to the subgenus Earomyia.

Lonchæa pleuriseta, sp. n.

Male and Female.—Glossy black, without a pronounced blue tinge. Orbits above, and upper half of frons shining, lower part of latter becoming whitish tomentose and densely so at anterior margin; face, parafacials, and cheeks densely white tomentose; antennæ and palpi black. Legs black, tarsi more or less broadly reddish yellow at bases. Wings clear, veins brown, paler basally. Calyptræ gray, fringes black. Halteres black.

Eyes densely hairy, the hairs on male much longer than those no female; third antennal segment about twice as long as wide, its apex almost at mouth-margin; cheek from margin of mouth to lower margin of eye wider than third antennal segment, with rather dense, erect, fine hairs; frons of male about twice as long as width at vertex, narrowed a little anteriorly, the surface with rather long hairs, some hairs above orbital bristle; frons of female about one-third of the head-width, the hairs as in male but shorter; dorsum of thorax with rather dense hairs; scutellum with numerous hairs on disc and some long setulose hairs on margin, which are almost as long as the marginal bristles; pteropleura with some setulose hairs in centre. Second costal division over half as long as first; inner cross-vein well in front of apex of first vein; veins 3 and 4 subparallel.

Length 4–5 mm.

Type.—Male, allotype, and 11 paratypes, Fort Snelling, Minn., April 28, 1920, (R. N. Chapman). Reared from puparia found under bark of dead oak tree, April 21, 1920. Type in collection of University of Minnesota.

Lonchæa ursina, sp. n.

Male.—Differs from the preceding species in having the frons narrower and with longer hairs, the third antennal segment narrowed at apex, the cheeks narrower and with more sparse, longer setulose hairs, thoracic dorsum with longer and denser hairs, pteropleura bare.

Length 4–5 mm.

Type and one paratype.—Naknek Lake, Alaska, (J. S. Hine). Type in collection of Professor Hine.

A NEW SPECIES OF THE GENUS PISSODES (COLEOPTERA).

BY RALPH HOPPING,
Division of Forest Insects, Dominion Entomological Branch.

Up to the present time only four species of Pissodes have been recognized from California.* Two of these are coast species, *Pissodes barberi* Hopk. and *P. radiatæ* Hopk. The former from Humboldt County probably breeds on the Sitka spruce, the latter is known to breed on the Monterey pine and Knobcone pine. The remaining two are found in the high mountains of the State. One, *Pissodes californicus* Hopk., breeding on the western yellow pine (*Pinus ponderosa* Laws.), and the other, *Pissodes yosemite* Hopk., breeding on *Pinus ponderosa* Laws., *Pinus lambertiana* Dougl. and *Pinus monticola* Don.

None of the California species mentioned above have been found breeding on the lodgepole pine (*Pinus contorta* Dougl.). The only species mentioned as breeding on lodgepole pine in Dr. Hopkins' monograph of the genus are *Pissodes*

*Contributions toward a monograph of the Bark-Weevils of the genus Pissodes, by A. D. Hopkins, Tech. Series, No. 20, Pt. 1, U. S. Dept. Agr, Nov. 11, 1911.

webbi Hopk. from Arizona and New Mexico and *Pissodes murrayanæ* Hopk. from Oregon.

The work of *Pissodes* in California has been observed by the writer to consist of two distinct methods of attack either on the stem just above and below the ground, as in the attacks of *P. yosemite*, or in the terminals of the stem and limbs, as in *Pissodes terminalis*, sp. nov., described below. It is very doubtful whether any Californian species employs both methods of attack. At present *P. terminalis* seems to be the only Californian species attacking the terminals.

Pissodes terminalis, sp. nov.

The general colour is yellow-brown. The elytral interspaces three and five are broader than two and four and distinctly elevated, especially interspace three. The striæ have deep, irregularly spaced punctures which are often obliterated by the scales. The elytra have yellow-scaled anterior spots and a more or less fused posterior band of white and yellow scales near the vertex of the declivity, the white scales extending to the *sutural median line and covering the first and second interspaces to the scutellum*. The apices of the elytra are covered with yellow scales. The white scales also extend across the median portion of the femora of both the middle and posterior pair of legs. The pronotum is densely covered with scales, those on the marginal half forming a white band which is sometimes fused with the pronotal spot. The basal angles are sub-rectangular, the margin of the pronotum slightly rounded basally and gradually restricted anteriorly toward the head. Pronotum distinctly not as wide as the elytra. The beak is moderate in length, stout and distinctly red in colour. Eye spots distinct and linear.

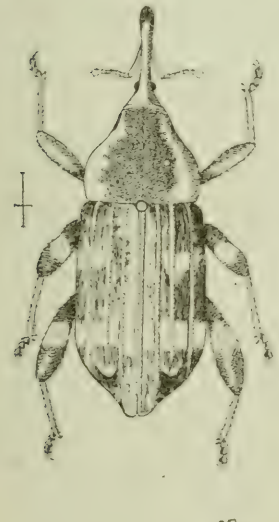

Fig. 15.
Pissodes terminalis, sp. nov.

Length 5.5 mm. to 6.3 mm.

Host tree.—*Pinus contorta* Dougl.

Distribution.—Sierra Nevada Mts. from Kern to Lassen Counties, California. Type locality, Chester, Plumas Co., California.

Type.—♂ and ♀ in the collection of the author where the species is represented by a series of 10 specimens. Paratypes are in the collection of the Entomological Branch at Ottawa, and the collection of the California Academy of Sciences at San Francisco. The distribution of the scales is more like *P. schwarzi* than that of any other species, except that the posterior band does not stop at the second interspace. Dr. Hopkins' key brings it nearer to *Pissodes fasciatus* Lec., from which it differs in the distinctly elevated third interspace. The accompanying illustration was drawn by my son, George Hopping.

The work of this beetle was first noticed by the writer in 1907 in Kern County, California, near Cannel Mdws. at an elevation of about 7,000 feet. Later it was found distributed from the region of Mt. Whitney to Lassen County.

California. The most epidemic of its depredations, however, was near Chester in Plumas Co. Here large areas of poles and saplings in lodgepole pine stands had seriously suffered from its attacks. While the terminals of the limbs were often infested the general attack was on the terminal of the stem. Depredations had continued in many trees for three successive years. This resulted in giving the trees a squat appearance, caused by curtailing the height growth with a consequent stimulation of lateral growth. Some areas of reproduction around Chester were badly infested by the fungus *Peridermium harknessii*. These areas were almost devoid of Pissodes attacks, and in the infested areas where infection from fungus was slight the Pissodes attacks were largely in the healthy trees. The terminal is generally killed down to and sometimes including the first whorl of branches. The larvæ mine the centre of pith of the terminal, each terminal producing from one to six adult weevils. The transformations take place in the fall, the adult apparently hibernating through the winter in the larval gallery. In many places the larvæ were heavily parasitized by a small dipterous insect.

AN INTERESTING OTIORHYNCHIDE WEEVIL FROM VANCOUVER ISLAND (COLEOPTERA).

BY H. F. WICKHAM.
Iowa City, Iowa.

Several years ago, I received from Mr. A. W. Hanham, of Duncan's, B.C., a few specimens of a weevil different from anything that I had seen in the North American fauna. It had much the appearance of some of the European species of Otiorhynchus and because of the general obscurity of the classification of the Otiorhynchidæ I did not feel at all sure as to its place in the system. Nothing in the Le Conte and Horn "Rhynchophora" matched it very well, either specifically or generically, and I put it aside as something new, to be described later. Not long ago, after seeing some specimens of *Phymatinus gemmatus* Lec., from Oregon, I was satisfied that the Vancouver Island species was pretty closely related, and wrote out a description referring the supposed novelty to the same genus, but fortunately discovered at almost the last moment that Dr. W. Dwight Pierce had already named a specimen from Oak Point, Wash., *Pauscopus* (*Phymatinus*) *sulcirostris*. The Vancouver Island examples agree with his description in nearly every respect, and I do not think that there can be any reasonable doubt as to their specific identity. However, as it is likely to figure in economic literature as a foe to flower gardens of British Columbia and the adjacent regions, I am allowing my description to stand, under the specific name that he has used, *Phymatinus sulcirostris* Pierce.

Form only moderately stout, hardly elongate, sides subparallel. Head rather narrow, eyes slightly oblique, broadly oval, prominent, limited behind by a groove. Rostrum moderately long, squarish in section at base, the height and breadth at that point being about equal, thence gradually and regularly

becoming about one-half wider to the tip, punctuation close, rather fine but deep and more or less confluent, extending well back on to the interocular area, median impressed line deep at middle, becoming evanescent between the eyes and just before the rostral apex. Vertex very finely and sparsely punctate. Above each eye is a band of pearly scales. Scrobes anteriorly visible from above, broad, becoming wider and shallower posteriorly, the deeper median portion directed against the lower border of the eye. Antennæ rather stout, scape reaching about to the middle of the eye, funicle a little longer, second joint about one-half longer than the first, third to sixth subequal, each about as long as wide, seventh a little longer and heavier, club oval, pointed, slightly annulate, pubescent except at base. Prothorax barely longer than wide, moderately convex longitudinally as well as transversely, apex truncate, about three-fifths as wide as the base, which is feebly bisinuate, sides divergent but nearly straight to the point of greatest width a little in front of the middle, thence subparallel but slightly concave to the base. Disk closely clothed with pearly scales through which protrude moderate sized mostly scattered granules, each with a median puncture. Middle line distinctly but not strongly canaliculate. Scutellum minute, transverse, scaly. Elytra conjointly slightly arcuately emarginate at base, wider just behind the obliquely rounded humeri, thence nearly parallel sided to behind the middle, whence they are arcuately narrowed to the apex. Disk convex, strongly declivous behind, densely covered with pearly scales and with rows of granules like those on the prothorax. Beneath roughly and, in general, closely and rugosely punctured, a patch of scales on each side of the metasternum and of the second abdominal segment. Middle and hind legs with an incomplete femoral annulus beyond the middle, more pronounced on the hind pair. Tarsi hairy above, first three joints golden pubescent beneath, third joint broad, bilobed. Claws simple, approximate at base and only slightly divergent. Length, excluding rostrum 9.50 mm., of rostrum about 1.75 mm. Width across elytra 4.20 mm.

Compared with *P. gemmatus* Lec., this species is similar in a general way, but that insect has the beak carinate instead of grooved, the antennæ more slender, the legs uniformly scaly and the elytral granules smaller as well as differently arranged. In *P. sulcirostris* the elytral vestiture is mostly condensed into an irregular curved band extending from the humerus to a point near the suture a little behind the middle, and a large, irregular patch before and extending to the apex.

The specimens communicated to the National Collection of insects at Ottawa, and to myself, were all sent by Mr. Hanham, who, however, informs me that he did not capture them himself. They were found at Quamichan Lake, nearby, and were handed to him by his neighbor, Mrs. Ethel A. Leather, who found them first early in May, 1916, feeding upon the leaves of *Lilium pardalinum*, in the broad light of warm and sunny days. She found many hundreds of the beetles, most of which were destroyed, and, on digging about the roots of the lilies, quantities of the larvæ and a few pupæ. There is every likelihood that the species may reappear as a pest of some importance along the north Pacific coast.

SOME NOTES ON THE ERIOPHYIDÆ (ACARINA) IN BRITISH COLUMBIA.

BY R. GLENDENNING,
Duncan, B.C.

In 1908 the writer noticed an infection of Big Bud on some black currant bushes that had been imported from England to a nursery on Vancouver Island. The affected bushes were destroyed, but in 1914 this pest was again noticed on bushes in a private garden which had been supplied from this nursery.

Upon the attention of the Dominion Entomological Branch being called to this through their Field Officer for British Columbia, Mr. R. C. Treherne, this officer and the late Dr. Hewitt visited the affection, and a thorough inspection was arranged for and made under the Provincial Department of Agriculture. This resulted in the finding and destroying of nearly eight hundred bushes which had been distributed from the nursery to various places on Vancouver Island. The possibility of the pest spreading to the various wild species of Ribes was not lost sight of; but it was not until 1916 that some bushes of *Ribes bracteosum* Dougl. (the wild black currant frequent by stream sides on the Pacific slope) were quite accidentally noticed to be affected.

These had apparently become affected by cuttings of infected bushes being placed, by a farmer for rooting purposes, in the sandy alluvium of a stream bed about one-half mile up stream; some of the cuttings being afterwards washed out by a flood. These bushes are still bearing the affection, though the mite is not making much headway.

Big Bud, I might here state for the benefit of those unacquainted with the pest, is caused by a true mite, which living hidden in the tightly-folded buds of the black currant sucks the juices therefrom, causing the buds to swell, become spherical instead of pointed, and finally to drop off during the summer without having expanded properly. Many hundred mites are located in one bud, and when the adult stage is reached in spring the mites migrate to the new buds. The result is partial, or in unchecked cases, total defoliation of the bushes; and from the fact that the mites are hidden in the buds for the greater part of the year and are so small when they do come out, intelligent spraying is very difficult and burning the affected bushes is usually resorted to, to get rid of this pest. This was the first record of this pest in N. America.

At Agassiz, on the Mainland, the frequent affection of the native hazel (*Corylus californica* Rose) with a similar mite was noticed; the pest having a good hold on this plant which is very common in some parts of the Fraser Valley, and eventuallytwo other native shrubs were noticed affected with the same mite, namely, *Ribes lacustre*, a very spiny gooseberry-like shrub, and *Ribes bracteosum*, the wild black currant –the same species that became affected on Vancouver Island with the escaped European mite.

A very interesting point is here raised by these discoveries regarding the specific identity of the mites on these plants, both in British Columbia and England. In England four species are commonly mentioned in reference books, namely, *Eriophyes avellana*, *E. ribis*, *E. grossulariæ*, and *E. pyri*, being named from their respective hosts. The last named, *E. pyri*, the common Pear leaf blister mite does not now interest us. The other three are not considered specifically distinct by some authorities in England and the finding of

the native hazel, gooseberry and currant as above mentioned, all affected by a mite which has every appearance of being the same, lends colour to the probability that the three forms found in England are not good species and would be transferable from one host to another. That this is what happens at Agassiz I have very little doubt.

In 1906 the late George Massee conducted some experiments at Wisley Gardens, England, with a view to testing the possibility of transferring the mite on the hazel, (*C. avellana*) to the cultivated black currant. The plan of his experiment, with which the writer had the pleasure of assisting, was to plant alternate bushes of infected hazels and clean black currants at a distance of about four feet and to observe if by ordinary means the mite on the hazel would attach itself to the currants.

Although the result of the experiment pointed to the immunity of the currant from the hazel mite the test was not sufficiently long or thorough for positive proof on that point.

That the hazel *C. californica* is the original and chief host of this pest in British Columbia there is little doubt. It is the exception and not the rule to find a bush of *Ribes* affected. On the South-eastern portion of Vancouver Island, where the hazel is quite scarce, I have never found the mite on either this shrub or on any *Ribes* sp. (with the exception of the previously-mentioned instance where the European mite had escaped), while at Agassiz the hazel is very common and is everywhere badly affected, in some cases 75% of the buds being arrested in development by the work of the mite.

Some European hazels on the Dominion Experimental Farm at Agassiz were also found to be affected by bud mites; whether imported with them on recent migrants from the neighboring woods it would be difficult to say.

The fact that this pest, which apparently lives on both hazel and currant, and is strongly entrenched in the Lower Fraser Valley, will have a retarding influence on the planting of these districts with small fruits, especially black currants; and it would certainly be folly to let any large acreage be planted until more investigational work has been done on this pest, and the fact that it will not affect the cultivated varieties of black currant and gooseberry has been proven beyond all doubt.

NEW RHOPALOCERA FROM THE FAR EAST.

BY WARO NAKAHARA, A.M., PH.D.
Elmhurst, Long Island, N.Y.

Leptidia inornata, n. sp.

Related to *L. amurensis* Mén.; both wings broader; upperside of fore wing devoid of the apical dark patch.

Male.—Wings broad, much broader than in *L. amurensis;* rounded at the apex. Upperside soft silky white, without markings except a dark suffusion along the anterior margin toward the base of the fore wing. Underside similar to the upperside in fore wing; hind wing with two nebular groups of dark atoms in the limbal area; the larger one extending from the 2nd to the 4th interspace, paralleling the hind margin, and the other, smaller one from the anterior angle obliquely toward the middle of the 5th interspace.

Expanse.—1⅞ inches.

Holotype.—♀, Sapporo, Hokkaido, Japan, July 18, 1916, (S. Kuwayama). Type in the collection of the author.

On account of its broad wings, this species resembles a certain form of *Pieris napi* L., and in fact it has often been so identified. In his list of the butterflies of Hokkaido, Mr. S. Kuwayama refers to this species as *P. napi* saying that it is not rare in that Island, but not found in the Main Island of Japan. In reality, this species belong to the genus *Leptidia*, as can be easily told by the small size of the discal cells of the wings.

Polygonia asakurai, n. sp.

Very close to *P. c-album* L.; black markings above generally heavier; a distinct black belt in the limbal area of hind wing; the white mark in middle of hind wing beneath V-shaped, with its arms widely open.

Male.—Fore wing above fulvous with an elongated black patch across the cell and at the end a larger patch of similar shape; an elongated sub-apical patch on the costa and one on the inner margin well separated; a row of three round spots running from the inner margin toward the lower end of the sub-apical patch, the first spot, which is cut by the vein II, being the largest; outer border blackish brown. Hind wing fulvous with three conspicuous black patches of about the same size in the discal area; a row of black spots forming a belt in the limbal area, running from the costal margin toward the anal angle; this belt and the dark brown outer border enclose a submarginal row of fulvous spots. Underside marbled with various shades of brown and ochre, and streaked with fine dark brown lines; the discal band across the wings irregular and indistinct. Fore wing with a grayish white patch on the costa externally to the discal band; a row of elongated olivaceous spots before the outer margin. The similar olivaceous spots less distinct in hind wing; a limbal series of round olivaceous spots; the discal band marked with an interrupted wavy black line on each side; the white mark in the middle V-shaped, with its arms of about equal length opening widely to form an angle of about 135 degrees.

Expanse.—1¾ inches.

Holotype.—♀, Horisha, Formosa, (K. Asakura), April 23, 1919. Type in the author's collection.

Oeneis pseudosatyra, n. sp.

Related to *O. nanna* Mén.; wings wood brown; eye-spots pupiled with purplish white. Hind wing beneath without eye-spots; an ill-defined dark wavy belt accompanied by a grayish cloud across the wing; no grayish markings in the basal area.

Male.—Upperside of fore wing wood brown, darker toward the base; an eye-spot, pupiled with purplish white, in the 2nd, and a larger one in the 5th interspace; brownish ring around the eye-spot indistinct. Hind wing similarly coloured, with four eye-spots similar to those of fore wing, the eye-spot in the 4th interspace much smaller than others, the one in the 2nd interspace being the largest. Underside a little lighter. Fore wing with the eye-spots of the upperside repeated; a faint dark submarginal line, and another one across the limbal area; a short, dark bar at the end of the cell; a grayish patch at the apex, whence it extends in a very narrow line half way along the outer margin. Hind

wing with an irregular dark brown belt, accompanied externally by a grayish nebular band, running from the middle of the costal margin to the anal angle; the row of eye-spots of the upperside replaced by a dark, regularly wavy submarginal belt; a grayish patch on the anterior angle, extending for a short distance along the anterior margin; another grayish patch at the end of the cell; the outer margin narrowly bordered with grayish.

Expanse.—1 4/5 inches.

Holotype.—♂, Horisha, Formosa, August 13, 1919, (K. Asakura). Type in the collection of the author.

The wood brown colour of the wing, closely resembling that of *Satyrus* marks this species very well in the genus *Oeneis*. This singular species of *Oeneis* forms an exception in this genus of "Arctics," on account of its occurrence in subtropical territory.

A NEW APHODIUS FROM BRITISH COLUMBIA. (COLEOPTERA-SCARABÆIDÆ).

BY RICHARD T. GARNETT,
Oakland, California.

Aphodius canadensis, sp. nov.

Form moderately elongate and convex, twice as long as wide, (form similar to that of *A. aleutus* var. *ursinus* Motsch.); black, shining, side margins of thorax a faint reddish-brown (wider at anterior angle), front margin of thorax narrowly yellow, sides of head with a faint brownish lustre, femora piceous, tibiæ rufo-piceous, tarsi paler. Antennæ rufo-testaceous, the club darker; palpi pale. Head moderately convex, an elevated tubercle at middle, and a small flattened tubercle on each side at the angulation of the clypeal suture; the suture elevated on each side from the angulation to the lateral margin; surface punctulate, more finely at middle, coarser on the sides and base; clypeus broadly and deeply emarginate, the angles on each side obtuse and rounded, the sides arcuate, the genæ more prominent than the eyes, fimbriate laterally, the fimbriations longer beneath the genæ, plainly visible from above. Thorax convex, broader at base than apex, narrowly margined, not explanate, sides slightly arcuate and finely fimbriate; hind angles broadly rounded, apical margin straight, base arcuate; disc finely closely punctate, intermixed on basal half and at sides with small cribrations; basal line distinct. Scutellum small, the base moderately closely punctured, the apex smooth. Elytra a little wider behind the middle, slightly narrower than the thorax at their junction, epipleuræ fimbriate on the basal third; disc glabrous, coarsely striate, the striæ strongly densely punctured on the basal three-quarters, less strongly apically; intervals nearly flat and finely closely punctured. Abdomen closely punctured, the punctures bearing rather coarse hairs. Mesosternum very prominently carinate between the coxæ, opaque and alutaceous in front. Anterior tibiæ punctate on the anterior face, the punctures setigerous and placed in a straight line from base to apex and nearer the outer edge; also a few terminal and lateral punctures; acutely tridentate, distinctly crenate above the basal tooth. First joint of anterior tarsus equal to the second. Posterior tibiæ stout, the posterior marginal fimbriations

long and unequal. First joint of hind tarsus equal to the following three. Length (.24 inch) 6 mm., width (.12 inch) 3 mm.

Type and paratype in the author's collection, collected at Cranbrook, British Columbia, July 12, 1919, and May 14, 1919, by Mr. C. B. Garrett. Four other paratypes of the same lot were studied, three from Cranbrook and one from Crow's Nest, B.C., secured between April 17, 1915, and May 14, 1919. Two of these are in the collection of C. B. Garrett, one is deposited in the collection of the California Academy of Sciences, and one in that of Dr. E. C. Van Dyke. Taking the entire series into consideration the length varies from 6–7½ mm. The carination of the mesosternum in two of the specimens was less pronounced than in the others, but nevertheless distinct.

This species has the form and general appearance of *A. aleutus* var. *ursinus* Motsch., and probably has been confused with it in collections. The long and unequal fimbriation of the hind tibiæ and the carinate mesosternum, however, serve to easily distinguish this from *ursinus* as well as from other black, shining species. According to the characters given by Dr. Horn* this would fit into Group 1-b with *rubeolus*, *stercorosus*, and the more recently described *troglodytes* and *campestris*, from which it is easily distinguishable, having an entirely different facies, colour, size, etc. An examination of boreal and Alaskan material in the cabinet of Dr. Van Dyke was made and no form parallel in structure could be found.

A key to this Group 1-b revised to date follows:—

1. Smaller—3–5 mm.; above not black, varying in colour.....2
— Larger—6–7½ mm.; more robust; black, head tuberculate; posterior tibiæ stout; sides of thorax with large and small punctures. British Columbia.....*A. canadensis*, sp. nov.
2. Posterior tibiæ stout; first joint of hind tarsus not as long as the next three; head not tuberculate; 3½–5 mm. Middle States to Missouri Texas, also rare in Massachusetts.....*A. rubeolus* Beauv.
— Posterior tibiæ rather slender.....3.
3. Sides of thorax with large and small punctures intermixed; 3½–4¼ mm. All east of Mississippi and north to Dakota.....*A. stercorosus* Mels.
— Sides of thorax finely punctulate, without coarse punctures.....4
4. Elytral intervals smooth; head and thorax reddish or pale chestnut brown; elytra brownish yellow. 3 mm. Sarasota, Fla. From beneath cow droppings.....*A. campestris* Blatch.
Elytral intervals with sparse fine punctures; colour honey yellow or reddish yellow. 3–3.8 mm. Crescent City, Fla. From tortoise burrows.....*A. troglodytes* Hubbard.

Mr. Garrett, to whom I am indebted for my specimens of *A. canadensis*, says that it is found rather abundantly at Cranbrook, which is in the southeastern part of British Columbia.

Of the five species mentioned in the key to the group *A. campestris* Blatchley is the only one I have not examined. The characters given in the table will serve to separate it from *A. troglodytes* Hubbard, although the punctuation of

*Dr. John Horn, Monograph of Aphodiini of U. S., Trans. Amer. Ent. Soc., Vol. 14, 1887, pp. 1-110.

the elytral intervals in the latter is sometimes very fine and a good magnification is necessary. Judging by their descriptions there is little to choose between these two species except their different habits. Greater differences might be noted if the descriptions of both species were not so abbreviated.

Bibliography of Group I-b.

Aphodius rubeolus Beauv., Ins. Afr. et Amer., 1805, 90.
A. stercorosus Melsh., Proc. Phil. Acad. Nat. Sci., Vol. 2, 1844, 136.
A. troglodytes Hubbard, Insect Life, 1894, p. 312.
A. campestris Blatchley, Canadian Ent., Vol. 44, 1912, p. 330.
A. canadensis, sp. nov.

NEW OR LITTLE-KNOWN CRANE-FLIES FROM TROPICAL AMERICA (TIPULIDÆ, DIPTERA).

BY CHARLES P. ALEXANDER,
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The majority of the new species described herein as new were secured by Mr. Herbert S. Parish along the Amazon River. The new *Teucholabis* was secured by Prof. Hine in Guatemala, and sent to me through the kindness of Dr. Kennedy. The new species are preserved in the collection of the author.

Teucholabis pabulatoria, sp. n.

Size very small (wing under 4 mm.); head gray; general coloration reddish yellow; pleura with an appressed gray pubescence; wings hyaline, the stigma small and ill-defined; Sc_1 ending just beyond the origin of *Rs;* R_{2+3} in alignment with *Rs;* cell R_3 very wide at the wing-margin.

Male.—Length 3.6 mm.; wing 3.5 mm.

Female.—Length 3.8 mm.; wing 3.7 mm.

Rostrum reddish brown; palpi dark brown. Antennæ with the scapal segments dark brown, sparsely pruinose; flagellum broken. Head light gray.

Pronotum reddish yellow. Mesonotum reddish brown, the præscutum without distinct stripes. Pleura reddish yellow, the ventral sclerites with a heavy, grayish white pubescence. Halteres light brown, the large knobs dark brown. Legs with the coxæ reddish, sparsely pruinose; trochanters dull yellow; femora yellow, the tips broadly dark brownish black; tibiæ brownish yellow, the tips narrowly dark brown; metatarsi light brown, the apical third blackened; remainder of the tarsi black. Wings hyaline, the stigma barely indicated, brown; veins dark brown. The microscopic trichiæ on the wing-disk are here larger than is usual in the genus. Venation: *Sc* short, Sc_1 ending a short distance beyond the origin of *Rs*, Sc_2 a short distance from the tip of Sc_1, located before the origin of the sector; R_1 beyond *r* very short, the tip pale; *Rs* long, gently arcuated, in alignment with and subequal to R_{2+3}; *r* in alignment with the deflection of R_{4+5}; cell R_3 very wide at the wing-margin; R_{4+5} bending strongly to the wing-tip; inner end of cell *1st* M_2 lying a short distance proximad of the inner ends of cells R_3 and R_4; basal deflection of M_{1+2} and the outer deflection of M_3 almost obliterated; basal deflection of Cu_1 a short distance beyond the fork of *M*.

Abdomen brown, the sternites paler. Male hypopygium with the pleurites

short, the tips projecting far beyond the very simple chitinized, pleural appendages which are situated on the inner face; these appendages are two in number, one appearing as a slender, cylindrical, chitinized arm, the other appendage appears as a flattened plate which runs out into a small, chitinized point. From the hypopygium projects a long, slender rod, pale, the tip enlarged and slightly blackened. The homologies of this rod cannot be told from the material at hand.

Habitat.—Guatemala.

Holotype.—♂, Gualan, January 13, 1905, (J. S. Hine).

Allotype.—♀.

The types were taken from the mouth of a female damsel-fly (*Hetærina tricolor* Burm.) by Dr. C. H. Kennedy. By the writer's key to the American species of *Teucholabis* (Trans. Amer. Ent. Soc., Vol. 40, pp. 235–239; 1914), *Teucholabis pabulatoria* will run to *T. jocosa* Alexander from which it is readily told by its small size, the very different coloration of the thorax, and the venation.

Erioptera (Mesocyphona) cladophora, sp. n.

Generally similar to *E. annulipes* Williston; tibiæ with four brown bands; *2nd Anal* vein strongly sinuous and with a spur before its tip.

Male.—Length 2.8 mm.; wing 2.8 mm.

Female.—Length 3.5 mm.; wing 3.5–3.6 mm.

Generally similar to *E. annulipes*, differing as follows:

Most of the femora with four brown bands; tibiæ with four narrow brown bands, alternating with four subequal white areas; metatarsi with the base and apex dark brown; tarsal segments three to five and the end of the second dark brown. Wings with a faint brownish tinge; large whitish subhyaline areas occupy the ends of all the cells along the wing-margin; similar white areas in the ends of cells *R* and *M* and before the large spur of the *2nd Anal* vein in cell *1st A;* small brown spots at the ends of all the longitudinal veins; a narrow, dark brown seam along the cord; veins dark brown. Venation: Generally as in *E. annulipes* but the *2nd Anal* vein is very remarkably distinct: very strongly bisinuous, almost as in the genera *Helobia* and *Symplectomorpha*, before the last curve with a strong spur that juts into cell *1st A*, this spur directed cephalad and basad, in some specimens almost attaining vein *1st A* and thus appearing as a supernumerary cross-vein in cell *1st A* (as in the genus *Discobola*); this spur is surrounded by a dark seam. Male hypopygium with two long, slender pleural appendages, the outermost bifid almost to the base and thus appearing as two separate appendages; inner appendage longest and more strongly curved than in the others; gonapophyses appearing as a long, slender, slightly-incurved rod with the apex blackened.

Habitat.—Brazil.

Holotype.—♂, Manaos, October 31, 1919, (H. S. Parish).

Allotopotype.—♀, November 4, 1919.

Paratopotypes.—11 ♂'s ♀'s, October 22–31, 1919.

Sigmatomera amazonica Westwood.

1881 *Sigmatomera Amazonica*, Westwood, Trans. Ent. Soc. London, part 3, pp. 366, 367; pl. 17. Fig. 3.

The female sex of this beautiful crane-fly has never been described. One specimen was taken at Flores, Brazil, November 12, 1919, by Mr. H. S. Parish and may be described as allotypic.

Allotype.—♀, length 11.5 mm.; wing 11.8 mm.

Rostrum and palpi very small, dark brown. Front obscure yellow. Antennæ black, the flagellar segments subcylindrical, feebly constricted beyond mid-length. Head moderately large, the vertex very narrow between the eyes and here with a sparse gray bloom; remainder of the head dark brownish black.

Thorax shiny black, the dorso-pleural membranes obscure yellow. Legs with the coxæ shiny black, the fore coxæ rufous apically; trochanters rufous; femora rufous, narrowly blackened basally and with the tips broadly black; tibiæ black, the bases a little paler; tarsi brownish black. Wings as in the male; cell *1st* M_2 open by the atrophy of the outer deflection of M_3.

Abdomen reddish, the seventh and succeeding segments black. Ovipositor with the tergal valves rather short and slender arising from a long basal shield, the apex dilated into a compressed tridentate blade, the ventral tooth larger and more flattened; from near the base of the tergal valves on the outer side, a pencil of long, curved, yellow bristles that are directed caudad and laterad; sternal valves of the ovipositor longer than the tergal valves, originating opposite the base of the dorsal shield, the tips acute.

Subgenus *Polymerodes*, subg. n.

Characters as in *Polymera*, s.s., but the tibial spurs lacking. Venation reduced, cell M_1 lacking and cell M_2 small, not longer than its petiole.

Type of the subgenus.—*Polymera* (*Polymerodes*) *parishi*, sp. n.

This new group is necessitated for the reception of three small species of *Polymera* in which the tibial spurs are quite lacking. In the typical subgenus, the tibial spurs are long and visible even with a hand-lens. It is very difficult to classify such forms since the females invariably run out to the genus *Erioptera* by means of the existing keys. The males have the beautiful bi-nodose antennæ of the typical subgenus. The species, besides the type, that are referable to this subgenus are *P. conjuncta* Alexander and *P. conjunctoides* Alexander.

The three known species may be separated by means of the appended key:

1. Size larger (wing of the male 4 mm. or over); antennæ conspicuously annulated, the base and apex of each flagellar segment light yellow, the remainder of the segment black; thoracic pleura with a very broad, black stripe that almost covers the entire region ..... *parishi*, sp. n.
   Size small (wing of the male less than 4 mm.); antennæ uniformly black; pleura uniformly pale or with a narrow dark stripe ..... 2.
2. Thoracic pleura with a narrow but distinct black longitudinal stripe ..... *conjunctoides* Alexander.
   Thoracic pleura without a distinct dark stripe, the pleura being approximately concolorous with the dorsum ..... *conjuncta* Alexander.

Polymera (Polymerodes) parishi, sp. n.

Flagellar segments black, annulated with yellow; thoracic pleura largely black.

Male.—Length about 4 mm.; wing 4–4.5 mm.

Generally similar to *P. conjuncta* Alexander, differing as follows:

Size larger. Antennal flagellum with the individual segments distinctly annulated, black with the base narrowly, the apex more broadly, light yellow; each flagellar segment is binodose, the nodes with very long, outspreading verticils. The thoracic pleura has a very broad, brownish black stripe that extends to the abdomen; thoracic sternum also brownish black, the space between this and the pleura only slightly paler. Wings with a strong brown tinge; vein *Sc* shorter; R_{2+3} shorter than that section of R_1 beyond *r*. Abdomen black.

Habitat.—Brazil.

Holotype.—♂, Manaos, November 4, 1919, (H. S. Parish).

Paratopotype.—A badly-broken ♂, October 31, 1919.

Eriocera amazonicola, sp. n.

General coloration orange-yellow; antennal flagellum brownish black, the scutal lobes and posterior half of the mesonotal præscutum brownish; wings yellow, narrowly cross-banded and longitudinally streaked with brown, this including a narrow apical margin.

Male.—Wing 9.3 mm.

Female.—Length 12 mm.; wing 10.8 mm.

Frontal prolongation of the head reddish brown; palpi obscure brownish yellow. Antennæ with the scape fiery orange; flagellum dark brownish black, only the extreme base of the first flagellar segment brighter. Head fiery orange, the frontal tubercle moderately large and with a slight, impressed, median line.

Mesonotum obscure yellow, the præscutum behind and the scutal lobes more brownish; scutellum and postnotum more orange-yellow. Pleura yellow. Halteres yellow, the knobs dark brown. Legs with the coxæ and trochanters yellow; femora obscure yellow, the tips narrowly dark brown; tibiæ obscure brownish testaceous, the tips very narrowly darker brown; tarsi dark brown. Wings with a strong yellowish tinge, most conspicuous in the costal region and at the wing-base; anal cells more grayish; conspicuous brown seams at the origin of *Rs*, extending to beyond midlength of the vein; along the cord, extending as a narrow cross-band from the stigma to the posterior margin of the wing; a narrow seam around the wing-tip; veins R_{4+5}, M_3, Cu_1, the outer end of cell *1st* M_2, *Cu* and *2nd A* narrowly margined with brown; veins light yellow, darkened in the brown areas. Venation: *Rs* long; *r* just beyond the fork of R_{2+3}; inner ends of cells R_5 and *1st* M_2 in oblique alignment; cell *1st* M_2 rather small, subrectangular, shorter than the veins beyond it; basal deflection of Cu_1 just beyond the fork of *M*.

Abdomen with the tergites fiery orange, segments five and six darker basally; sternites orange-yellow. Ovipositor with the valves elongate, chitinized.

Habitat.—Brazil.

Holotype.—♀, Manaos, November 4, 1919, (H. S. Parish).

Allotype.—♂, Flores, November 12, 1919.

The male specimen is in poor condition, having been badly eaten by ants. The hypopygium is of the *Eriocera*-type but the penis-guard is very long and exserted, somewhat as in *E. longistyla* Alexander.

UNDESCRIBED AFRICAN CRANE-FLIES IN THE BRITISH MUSEUM. (TIPULIDÆ, DIPTERA).

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For the past several years the writer has been engaged in preparing a monographic revision of the crane-flies of the Ethiopian Region. The collections of many of the museums in America, Europe and South Africa have been generously loaned me for study in the continuation of this work. The largest collections of tropical African Tipulidæ available are those of the British Museum (Natural History), and I would express my sincere thanks to Mr. F. W. Edwards for his kindness in sending me this material. The Limnobiinæ of this collection are discussed in another paper; part of the Tipulinæ are described in this article.

Genus *Habromastix* Skuse.

Habromastix edwardsiana, sp. n.

General coloration rusty-brown; wings pale brown, cells *C* and *Sc* and the wing-apex dark brown; a pale area before and beyond the stigma; fusion of M_3 and Cu_1 extensive; abdomen black, ringed with obscure yellow.

Male.—Length 10.5 mm.; wing 10.4 mm.; antenna 10.3 mm. Hing leg, femur 6.3 mm.; tibia 9 mm.

Female.—Length 10.3 mm.; wing 10.2 mm.

Rostrum and palpi pale brown. Head vertical in position, the frontal prolongation very short. Antennæ pale brownish yellow, brightest basally, the outer segments darker; scapal segments small; first flagellar segment enlarged basally; flagellar segments clothed with a long, erect pubescence and provided with a few, very tiny, black verticils. Vertex bright brown; head between the eyes broad.

Mesonotal præscutum rusty-brown without stripes; remainder of the mesonotum a little darker. Pleura pale brown, the mesepimeron a little brighter. Halteres pale brown, the base of the stem brighter, the knobs dark brown. Legs with the coxæ and trochanters brownish yellow; femora and tibiæ pale yellowish brown, the tips conspicuously blackened, the latter very narrowly; tarsi yellowish brown, only the distal segments darkened. Wings with a strong, brownish tinge; cells *C* and *Sc* dark brown; stigma dark brown; apices of cells R_2 and R_3 strongly darkened; cross-veins and deflections of veins indistinctly seamed with brown; a conspicuous whitish area before the stigma in cell *2nd* R_1 and a smaller, but similar, area beyond the stigma in the base of cell R_2; cells in the vicinity of *1st* M_2 indistinctly centred with paler; veins dark brown. Venation: *Rs* strongly arcuated at origin; tip of R_1 somewhat indistinct; basal deflection of R_2 nearly as long as *r*; cell *1st* M_2 pentagonal; petiole of *cell* M_1 about equal to *m*; basal deflection of Cu_1 just beyond the fork of *M*, the fusion of M_3 and Cu_1 being a little shorter than the basal deflection of M_{1+2}.

Abdomen with the first segment yellow; remaining segments with the basal and apical thirds black, the middle third obscure yellow, producing a narrow, pale-ringed appearance; eighth and ninth segments black. In the female, the abdomen is almost uniformly drak brown in colour and greatly distended with eggs. Male hypopygium of an unusually generalized structure,

not unlike that occurring in the subfamily Limnobiinæ; ninth tergite almost straight across the caudal margin; pleurites subcylindrical, each with two pleural appendages, borne at the apex; the outer appendage is flattened, pale, elongate-oval in outline; inner appendage flattened, clothed with conspicuous dense hairs; on the dorsal face before the tip produced into a long, blackened point that extends beyond the other parts of this appendage; pleural suture indicated only beneath, straight. Ninth sternite membranous, the caudal margin with a deep, rounded, median notch. Penis-guard a simple, cylindrical rod. Anal tube conspicuous, pale. Ovipositor with the tergal valves compressed, strongly upcurved, the tips subacute; sternal valves very compressed and flattened, the tips obtusely rounded.

Habitat.—Ashanti.

Holotype.—♂, Obuasi, June 20, 1907, (Dr. W. M. Graham), B. M. No. 1908–245.

Alloiopotype.—♀, in the copula with the male.

The types were caught in dense bush on a leaf.

Type in the collection of the British Museum (Natural History).

Habromastix riedeliana, sp. n.

Antennæ moderately elongated; mesonotum yellowish red, unmarked with darker; wings pale brown, the costal region slightly darker; fusion of M_3 and Cu_1 punctiform; abdomen yellow, striped longitudinally with black.

Male.—Length about 11.8 mm.; wing 11.5 mm. Hing leg, femur 7.5 mm.; tibia 9.7 mm.

Female.—Length about 12 mm.; wing 11.5 mm.

Frontal prolongation of the head short but evident, brownish yellow; nasus lacking; palpi short, dark brown. Antennæ moderately elongate, in the male, if bent backward, extending about to mid-length of the abdomen; but nine flagellar segments; scape and basal swelling of the first flagellar segment yellow, remainder of the flagellum dark brown, clothed with a dense, erect, pale pubescence; verticils short and sparse. Head brownish, covered with a pale pollen; no vertical tubercle; vertex between the comparatively small eyes broad.

Mesonotum light yellowish red without darker markings. Pleura obscure yellow. Halteres long and slender, pale yellow, the knobs dark brown. Legs with the coxæ and trochanters yellow; femora yellow basally, the outer half pale brown, the tips dark brown; tibiæ pale brown, the tips narrowly dark brown; tarsi brown. Wings with a pale brownish tinge, the costal and subcostal cells, and the stigma, slightly darker brown; veins indistinctly seamed with brown; an indistinct whitish spot before the stigma in cell *1st* R_1 and another crossing cell *1st* M_2; veins dark brown. Venation: *Rs* rather short and feebly arcuated, about equal to R_{2+3}; cell R_2 large, veins R_2 and R_3 divergent; cell *1st* M_2 rather small, pentagonal; petiole of cell M_1 about one-half longer than *m;* fusion of M_3 and Cu_1 very slight, almost punctiform.

Abdomen yellow, heavily lined with black; basal tergite yellowish brown; second tergite yellow with brown median and lateral stripes; tergites three to seven with the conspicuous median and lateral stripes broadly connected apically so that only the sides at the base are of the obscure yellow ground-colour. Eighth

segment entirely black; hypopygium reddish. Abdomen of female dark, distended with eggs; ovipositor reddish horn-colour. Male hypopygium somewhat as in *H. edwardsiana;* ninth tergite with a shallow median notch and broader and slightly deeper lateral notches. Sterno-pleurite prolonged considerably beyond the level of the tergite, the pleural appendages borne at the apex; outer appendage slender, pale; inner appendage a flattened blade with the apex bifid, the base rounded and tumid, densely hairy. Ninth sternite with a very deep and narrow U-shaped median notch. Eighth sternite with a very low V-shaped notch, the margin unarmed. Ovipositor with the tergal valves comparatively slender; sternal valves long, compressed, the tips obtuse.

Habitat.—Nyasaland.

Holotype.—♂, Mt. Mlanje, January 6, 1913, (S. A. Neave).

Allotype.—♀, January, February, 1914, (J. B. Davey).

Presented by the Imperial Bureau of Entomology 1913–236, 1915–58.

Type in the collection of the British Museum (Natural History).

Genus *Tipula* Linnæus.

Tipula (Tipulodina) milanjii, sp. n.

Coloration orange-yellow; præscutum and scutum largely shiny black; legs black, the tibiæ with a broad whitish ring beyond the base; wings brownish yellow, stigma oval, dark brown; abdomen orange-yellow, the tergites ringed caudally with velvety black.

Female.—Length about 26.5 mm.; wing about 21.5 mm.; abdomen alone, 19.2 mm. Fore leg, femur 10.7 mm.; tibia 13.3 mm.; metatarsus, 9.8 mm.; 2nd tarsal segment 3.1 mm.; 3rd to fifth tarsal segments 3 mm. Hind leg, femur 13.8 mm.; tibia 15 mm.

Frontal prolongation of the head rather short, clear orange-yellow; nasus short and stout; mouth-parts and palpi brown. Antennæ with the scapal segments fiery orange; flagellar segments cylindrical, dark brown; verticils rather short. Head fiery orange; a small black spot on the ventral side adjoining the inner margin of the eye; vertex broad, eyes small.

Pronotum yellow. Mesonotum yellow, the præscutum with three broad, shiny black stripes, the narrow interspaces opaque velvety-black so the dorsum appears to be almost entirely black, only the lateral regions of the ground colour; scutal lobes shiny black; scutellum clear light yellow, the lateral wings brown; postnotum light yellow. Pleura light orange-yellow. Mesosternum a little infuscated. Halteres dark brown, the base of the stem narrowly pale. Legs with the coxæ and trochanters orange-yellow; femora dark brownish black, the extreme base brighter; tibiæ black with a rather broad (1.7 mm.) whitish ring just beyond the base; tarsi brownish black; metatarsi much shorter than tibiæ; femora slightly enlarged apically; claws of female simple, empodia pale. Wings rather broad, with a pale brownish yellow suffusion; cell *C* light brown, cell *Sc* dark brown; stigma dark brown, oval; indistinct brown seams along the cord; veins dark brownish black. Venation: *Rs* rather short, slightly arcuated; R_2 short, about one-half the length of R_{2+3}; *m-cu* very short but present.

Abdomen with tergites one to five orange-yellow; segments two to five with the posterior margins deep velvety-black and sending a paler brown band cephalad to the anterior margin of the segments; tergites six and seven similar

but the basal half entirely dark brown; eight and nine orange; sternites generally similar, segments two to five with a brown posterior band, reduced to a triangle on the second and third segments, the second segment with an additional brown band near midlength; segments six and seven dark brown, the caudal margin very narrowly yellow. Ovipositor with the tergal valves long and slender, the tips curved a little ventrad; sternal valves compressed, the tips broadly rounded.

Habitat.—Nyasaland.

Holotype.—♀, Mt. Mlanje, November 21, 1912, (S. A. Neave).

Presented by the Entomological Research Committee 1913–394.

Type in the collection of the British Museum (Natural History).

This magnificent crane-fly is apparently related to the much smaller and less brightly coloured *Tipulodina kinangopensis* Riedel (British East Africa) and is referred, provisionally, at least, to the subgenus *Tipulodina* Enderlein. The white tibial bands in the present species suggest that this reference is correct although the two African forms are very much more brightly coloured than the numerous Oriental species as known. *Tipula milanjii* in its general appearance suggests a large and handsome species of *Nephrotoma*.

Tipula silinda, sp. n.

Allied to *T. jocosa;* mesonotal præscutum yellow with three yellowish stripes that are margined with brown; lateral and anterior margins of the præscutum dark brown; postnotum yellow, the caudal margin dark brown including a dark brown spot above the base of the halteres; pleura yellow, faintly marked with brown; legs yellow, tips of the femora broadly blackened; wings brownish subhyaline, a darker brown spot at arculus, stigma dark brown, brown seams along the cord; whitish obliterative areas beyond the arculus and before the stigma; cell *1st* M_2 ample; abdomen brownish yellow, margined sublaterally with dark brown.

Female—Length 25 mm.; wing 22.5 mm.; abdomen alone, 17.8 mm. Fore leg, femur 14.5 mm.; tibia 17.8 mm.; metatarsus 16.2 mm.

Frontal prolongation of the head brownish yellow; mouth-parts and palpi brown. Antennæ with the scape and basal two or three flagellar segments yellow, the remainder of the flagellum passing into dark brown; verticils long and conspicuous. Head obscure brown.

Pronotal scutum light brown; scutellum more yellowish. Mesonotal præscutum obscure yellow, the three stripes concolorous and evident only by their brown margins; median stripe with the lateral margins ill-defined at midlength and with a broad, brown median stripe; lateral stripes with the brown margins distinct, the lateral margin broader than the proximal; at the anterior ends of the lateral stripes a large, rounded, dark brown spot; anterior margin of the præscutum narrowly dark brown; scutum obscure yellow anteriorly, dark brown posteriorly, this colour confluent across the median line; scutellum with the median area yellow, narrowly margined caudally with brown, the lateral wings of the scutellum similarly yellow but here margined anteriorly with brown; postnotum with the median sclerite yellow with two indistinct brown lines, the caudal margin with two dark brown spots; lateral sclerites of the postnotum yellow, the dorsal anterior margin brown, extending to beneath

the wing-root; ventral posterior margin, immediately dorsad of the base of the halteres conspicuously dark brown. Pleura yellow, a pale brown cloud on the dorsal margin of the mesosternum and another on the caudal margin of the mesepimeron. Halteres with the base and knobs conspicuously light yellow the remainder of the stem dark brown. Legs with the coxæ yellow, the outer face of the posterior coxæ infumed; trochanters yellow; femora yellow, the tips broadly (1.8 mm.) and abruptly blackened; tibiæ brownish yellow, the tips rather narrowly dark brown; tarsi brown, darker distally. Wings with a faint brownish tinge, cell *Sc* more brownish yellow; stigma brown; a brown spot at the arculus; brown seams along the cord, outer and anterior margin of cell *1st* M_2; obliterative areas beyond arculus and before the stigma; veins dark brown. Venation: similar to *T. pomposa* but veins *Rs* and R_{2+3} in alignment; *Rs* shorter than R_{2+3}; vein R_3 bent a little toward R_{4+5} (as in *T. alphaspis*); cell *1st* M_2 very large, roughly rounded-oval in outline; fusion of M_3 and Cu_1 extensive, longer than the basal deflection of M_3.

Abdomen with the basal tergites obscure yellowish, beyond the second more brownish; lateral margins of the segments narrowly light yellow; a broad, dark brown, submarginal stripe; sternites more uniformly reddish yellow. Ovipositor with the tergal valves very long and slender, straight, divergent; sternal valves ending about opposite mid-length of the tergal valves, compressed.

Habitat.—Southern Rhodesia.

Holotype—♀, Mt. Chirinda, Melsetter District, altitude 3,800 feet, June 11, 1911, (C. F. M. Swynnerton).

Presented by the Entomological Research Committee 1912–145.

Type in the collection of the British Museum (Natural History).

Tipula silinda is somewhat similar to *T. pomposa* Bergroth but is very distinct in the details of coloration and structures. It is closer to *T. jocosa* Alexander (Cape Colony—Natal) and *T. masai*, sp. n. (British East Africa) as discussed under this latter species. The specific name, *silinda*, is the Zulu form of Chirinda, for the explanation of which I am indebted to Dr. G. A. K. Marshall.

Tipula masai, sp. n.

Allied to *T. jocosa;* antennæ yellow; wings grayish subhyaline, variegated with brown seams and hyaline spaces in certain of the cells.

Female.—Wing 18 mm. Middle leg, femur 9.5 mm.; tibia 10.5 mm. Hind leg, femur 10 mm.; tibia 12.1 mm.

Frontal prolongation of the head rather slender, brownish yellow, paler ventrally, with a narrow, brown, lateral line; mouth-parts yellowish; palpi dark brown. Antennæ light yellow, only the distal segments darker coloured. Head reddish brown.

Pronotum light brown. Mesonotal præscutum obscure yellow with four narrow, light yellow stripes that are narrowly margined with dark brown so as to practically obliterate the ground colour; intermediate stripes bent away from one another near mid-length, exposing a linear strip of the ground colour; anterior and lateral margins of the præscutum dark brown; scutum yellow, the lobes indistinctly margined anteriorly with brown, the posterior half broadly and conspicuously margined with brown, this colour bridging the posterior half

of the median area; scutellum and postnotum obscure brown; a slightly darker brown spot on the lateral sclerites of the postnotum above the base of the halteres Pleura indistinctly marked with pale brown and whitish. Halteres light brown, the base of the stem and the knobs conspicuously light yellow. Legs with the coxæ and trochanters yellow, the outer face of the middle coxæ infuscated; femora yellow, a little brightened immediately before the broad, black tips; tibiæ obscure yellow, the tips narrowly and indistinctly darkened; tarsi light brown, passing into darker brown at the tips. Wings grayish subhyaline, sparsely marked with brown and variegated with hyaline; costal cell slightly more yellowish, the subcostal cell brownish yellow; stigma brown; conspicuous brown seams at the origin of *Rs;* along the cord in the bases of cells R_3 and R_5; completely surrounding cell *1st* M_2 and at the fork of M_{1+2}; deflection of Cu_1 broadly seamed with brown; a large brownish area near the arculus in the bases of cells *R* and *M;* a large obliterative streak along the cord, extending from before the stigma, across cell *1st* M_2 into the base of cell M_4; smaller hyaline areas beyond the stigma, in the bases of cells M_1 and *2nd* M_2; and two others in the end of cell *1st A*, one adjoining vein *1st A*, the other nearer the *2nd Anal* vein; veins dark brown. Venation: somewhat as in *T. jocosa*, differing as follows: *Rs* longer, a little longer than R_{2+3}; base of R_2 before *r* longer, apex of R_2 beyond r long and almost straight; cell *1st* M_2 roughly oval in outline, the basal deflection of M_{1+2} being shorter than the deflection of M_{3+4}; M_{1+2} between *r-m* and *m* long, evenly and gently arcuated; petiole of cell M_1 shorter than *m; m-cu* short but evident.

Abdomen broken beyond the base, the first tergite brown, narrowly margined caudally with yellow; base of the abdomen filled with large eggs.

Habitat.—British East Africa.

Holotype.—♂, Southeastern slopes of Mt. Kenya, altitude 6,000–7,000 feet, February 3–12, 1911, (S. A. Neave). B. M. No. 1912–70.

Type in the collection of the British Museum (Natural History).

Tipula masai is told from the related *T. jocosa* and *T. silinda* by the different pattern of the posterior sclerites of the mesonotum. From *jocosa* it is also readily told by the yellow antennæ and very distinct venation. The coloration of the mesonotal postnotum is sufficient to distinguish *T. silinda* from *T. masai*. The three species here mentioned form a group of rather closely-related forms that are readily told by their peculiar thoracic pattern and yellow-knobbed halteres.

Tipula bartletti, sp. n.

General coloration reddish brown, the præscutal stripes nearly concolorous, narrowly margined with dark brown; scutellum and postnotum largely brown; a small, brown spot on the sides of the præscutum and on the lateral sclerites of the postnotum; wings brownish yellow, the costal region darker; fusion of M_3 and Cu_1 punctiform.

Sex?—Wing about 25 mm. Hind leg, femur 16.1 mm.; tibia 16.5 mm.

Head destroyed by pests.

Pronotum yellow, indistinctly infuscated on the sides.

Mesonotal præscutum reddish brown with four almost concolorous stripes that are narrowly margined with dark brown; median stripe narrowly split by

a capillary dark brown line; interspaces dark; lateral margins obscure yellow; a small, brown spot on the lateral margin opposite the anterior end of the lateral stripes; scutal lobes brown; scutellum brown, the lateral wings paler; postnotum with the median sclerite largely uniform brown, the lateral margins narrowly, the posterior margin more broadly, pale; lateral sclerites of postnotum with an ill-defined brown spot near the centre. Pleura obscure unicolorous yellow. Halteres broken. Legs with the coxæ and trochanters obscure yellow; femora light brown, the tips rather narrowly blackened; tibiæ brown, the tips narrowly and indistinctly darkened; tarsi dark brown. Wings with a strong brownish yellow tinge, the costal and subcostal cells more saturated; basal deflection of R_{4+5} and *r-m* indistinctly seamed with darker; *Cu* and its branches likewise seamed with darker; veins dark brown. Venation: *Rs* shorter than R_{2+3}; petiole of cell M_1 a little longer than *m*; fusion of M_3 and Cu_1 very slight.

Abdomen reddish brown, the tergites with indistinct lateral stripes; apex of the abdomen broken.

Habitat.—Madagascar.

Holotype.—Sex?, Ekongo, South-western Madagascar, (E. Bartlett) B. M. No. 78–58.

Type in the collection of the British Museum (Natural History).

Tipula victoria, sp. n.

Closely allied to *T. zambeziensis;* size larger, wing over 19 mm.; ninth tergite of the male hypopygium produced caudad into a short, broad, median lobe whose posterior margin is gently concave, the lateral lobes neither conspicuous nor divergent.

Male.—Length 20–21 mm.; wing 19.5 mm.

Female.—Length about 21 mm.; wing 19.5 mm.

Generally similar to *T. zambeziensis* Alexander, differing as follows: Size larger; brown seams along the deflection of R_{4+5} and *r-m* more extensive and distinct; stigma dark brown. In the allotype veins M_3 and Cu_1 are fused for a considerable space, but in the type male this fusion is punctiform. The female has a rounded dark brown spot on the lateral margin of the præscutum, but otherwise the mesonotum is quite unmarked with darker as in this group of species. The wings of the female are darker than those of the male, with a large obliterative area before and a somewhat smaller spot beyond the stigma. Male hypopygium with the ninth tergite extensive, the median area produced caudad into a short, broad, depressed or slightly hollowed-out lobe whose posterior margin is rather deeply concave, the lateral lobes short and not divergent as in *T. zambeziensis*. Ninth sternite profoundly incised medially as in the *zambeziensis* group of species, the notch extending almost to the eighth sternite; at the base of this notch are two parallel pencils of stiff, erect bristles, directed caudad; in *zambeziensis* these bristles are less conspicuous and tend to be decussate apically.

The female is considerably darker than the male, but for the time being, at least, must be considered as belonging to this same species.

Habitat.—Uganda.

Holotype.—♂, Mabira Forest, Chagwe, altitude 3,500–3,800 feet, July 16–25, 1911, (S. A. Neave). B. M. No. 1913–140.

Allotopotype.— ♀.

Type in the collection of the British Museum (Natural History).

Tipula milanjensis, sp. n.

Allied to *T. zambeziensis;* general coloration bright orange-yellow; thorax unmarked with darker; abdomen with a narrow, blackish subterminal ring; antennæ of male moderately elongated; wings nearly hyaline, iridescent, stigma dark brown.

Male.—Length about 20 mm.; wing 19.3 mm.

Hind leg, femur 13.8 mm.; tibia 15 mm.; metatarsus about 24 mm.

Frontal prolongation of head moderately long, orange-yellow; nasus long; mouth-parts and palpi obscure yellow. Antennæ rather long, if bent backward, extending about to the base of the halteres; scape orange; flagellum light brown, the distal segments darker brown; segments elongate-cylindrical, the verticils about as long as the segments that bear them. Head orange yellow.

Mesonotum orange-yellow without distinct darker markings; scutellum and postnotum paler yellow. Pleura yellow. Halteres brownish yellow, the knobs dark brown. Legs with the coxæ and trochanters light orange-yellow; femora pale brown, the bases still paler, the tips rather broadly blackened; tibiæ dark brown, the tips narrowly and indistinctly blackened; tarsi dark brownish black; tarsi very long and slender; claws toothed. Wings nearly hyaline, iridescent, the subcostal cell slightly darker; stigma dark brown, conspicuous; an indistinct brown cloud at the deflection of R_{4+5} and *r-m*, and another at the wing-margin at the end of vein Cu_2. Venation: *Rs* short, almost straight; fusion of M_3 and Cu_1 slight.

Abdominal tergites brownish orange, the basal tergites bright orange, segments three to six brownish orange; a narrow, subterminal black ring, including most of segment seven and segment eight with the exception of a narrow, orange-brown caudal margin; hypopygium brownish orange. Male hypopygium with the sclerites fused into a continuous ring as in this group of species. Ninth tergite extensive, the median area produced caudad into a broad, flattened lobe, the caudal margin of which is provided with a low,U-shaped notch, the lateral lobes and margin quite unarmed with spinules. Outer pleural appendage rather narrow, tapering to the subacute tip, pale, the surface covered with comparatively short setæ; inner pleural appendage produced into an inner blade that juts toward the ninth tergite, the proximal face covered with numerous short hairs; the outer margin is provided with a very powerful black spine and a small, apical flattened blade. Ninth sternite with a broad and profound median notch, the base of this incision almost coincident with the posterior margin of the eighth sternite; base of the notch broad, provided with two flattened sheaths of long, reddish yellow bristles, their tips decussate. Eighth sternite unarmed.

Habitat.—Nyasaland.

Holotype.—♂, Mt. Mlanje, December 28, 1912, (S. A. Neave).

Presented by the Entomological Research Committee 1913–236.

Type in the collection of the British Museum (Natural History).

Tipula hova, sp. n.

Allied to *T. zambeziensis;* general coloration bright orange-yellow, the

thorax unmarked with darker; male hypopygium with the median lobe of the ninth tergite short, the caudal margin with a broad, U-shaped notch.

Male.—Length 22 mm.; wing 21.5 mm. Hind leg, femur 12.1 mm.; tibia 14.6 mm.

Female.—Length 26 mm.; wing 18.5 mm.

Head and frontal prolongation clear light yellow; rostrum and palpi pale brown. Antennæ with the scape yellow; flagellum light brown, the basal swellings indistinctly paler, brownish yellow.

Mesonotum orange-yellow, the præscutum and scutum with the usual three stripes lacking or barely indicated; scutellum and postnotum clearer yellow, unmarked. Pleura clear orange-yellow, unmarked. Halteres light brown, the base of the stem narrowly light yellow. Legs with the coxæ and trochanters orange-yellow; femora yellowish brown, the tips broadly blackened; tibiæ light brown, the tips scarcely darkened; tarsi brown; claws toothed. Wings brownish subhyaline, cell *C* more yellowish, cell *Sc* more brownish; stigma brown; very indistinct seams along *r-m* and the basal deflection of Cu_1; veins dark brown. Venation: as in the subgenus; fusion of M_3 and Cu_1 punctiform.

Abdomen with the basal tergites orange-yellow, the basal third of the intermediate segments paler yellow and destitute of pubescence; segments six to nine more yellowish brown; a conspicuous, interrupted, brown, lateral stripe on tergites two to four. In the female, the dark lateral stripe is more extensive. Male hypopygium as in the *zambeziensis* group but rather more enlarged than usual. Ninth tergite with the median lobe short, the caudal margin with a broad and deep U-shaped notch, the lateral lobes rather slender, lying subparallel; viewed from the side, appearing as conspicuous flattened blades. Outer pleural appendage pale yellow, elongate-oval, the apex obtusely rounded, the outer face of the lobe with sparse bristles, longer and fringe-like at the apex. Inner pleural appendage moderately complicated in structure, consisting of an inner blade that juts against the ninth tergite, the proximal face densely clothed with long, yellow hairs, and an outer blade that bears a somewhat oval area of about a score of erect, black, spinous bristles; between these two blades lies a slightly curved, cylindrical arm with the apex truncated and heavily chitinized. Ninth sterno-pleurite with a broad and very deep V-shaped median notch that is deeper than in any other species of this group so far made known, the base lying underneath the caudal margin of the eighth sternite; beneath this profound incision is a membranous tissue, at about mid-length of the split with two contiguous flattened lobes, each fringed with a sheath of reddish bristles that are directed caudad, these longest proximally, decreasing in length outwardly. Ovipositor with the tergal valves very slender, straight; sternal valves compressed, the tips obtuse.

Habitat.—Madagascar.

Holotype.—♂, (W. D. Cowan). B.M. No. 80–45.

Allotype.—♀, Region south-east of Fort Dauphin, December, 1900, (Ch. Alluaud).

Paratopotype.—♂.

Paratypes.—♂, Ambohimitombo Forest, November, 1894, (Dr. Forsyth-Major); ♂, Tamatave, 1906, (A. Sauzier). B. M. Nos. 98–46, 1906-291; 6 ♂ ♀'s, Forêt e d'Andrangoloaka, Imerina, 1891, (A. Grandidier).

Type in the collection of the British Museum (Natural History); allotype in the collection of the Paris Museum.

The specific name, *hova*, is that of the natives inhabiting the central provinces of Madagascar.

Tipula meliuscula, sp. n.

Antenal scape yellow, flagellum indistinctly bicolorous; head cinnamon-brown with a conspicuous, dark brown, median stripe; præscutum brown with four obscure yellow stripes; remainder of the mesonotum dark brown and yellowish; pleura obscure yellow, a brown spot between the fore and middle coxæ; wings grayish subhyaline, the deflection of Cu_1 conspicuously seamed with dark brown; male hypopygium with the ninth tergite short, the caudal margin with two widely-separated rounded protuberances.

Male.—Length 15 mm.; wing 17 mm.

Frontal prolongation of the head dark brown above, more yellowish on the ventral half; palpi dark brown. Antennæ with the scape yellow; flagellum brown, the basal enlargement of each segment dark brown, the remainder slightly paler; the first scapal segment bears numerous rather short bristles on the outer face and a group of three larger bristles on the inner face, arranged in a transverse row before the tip; flagellar verticils elongate. Head rich cinnamon-brown, the vertex and occiput with a conspicuous, dark brown median stripe.

Pronotum obscure brownish yellow, darker brown on the sides. Mesonotal præscutum brown with four narrow, obscure brownish yellow stripes that are margined with darker brown; lateral margins of the sclerite in front of the pseudosutural foveæ narrowly blackened; scutal lobes brownish black, the centres indistinctly yellowish; scutellum pale testaceous, the posterior margin weakly infuscated; lateral wings of the scutellum brownish black; postnotum with the median sclerite largely dark brown, the posterior third, a median blotch near the base and the lateral margins pale; lateral lobes of the postnotum brownish black, the ventro-cephalic portion yellowish. Pleura obscure yellow with a brown spot near the dorsal margin of the mesosternum immediately behind the fore coxa; mesepisternum slightly infuscated. Halteres dark brown, the extreme base conspicuously yellowish orange. Legs with the coxæ obscure yellow, the outer faces of the fore and middle coxæ slightly infuscated; trochanters yellow; remainder of the legs broken. Wings grayish subhyaline; cell *C* light yellow, cell *Sc* pale brown; a brown spot before the arculus; stigma narrow, dark brown; conspicuous brown seams at the deflection of R_{4+5} and *r-m* and along the deflection of Cu_1; obliterative areas before the stigma in cell *1st* R_1 and beyond the stigma in the base of cell R_2. Venation: *Rs* short, straight, about equal to R_{2+3}; petiole of cell M_1 a little shorter than *m*; fusion of M_3 and Cu_1 short.

Abdominal tergites brownish yellow, the basal segments brightest, the lateral margins of the tergites narrowly dark brown; sternites generally similar to the tergites. Male hypopygium with the ninth tergite short, the caudal margin with two rounded protuberances that are widely separated, the space between appearing as a broad, U-shaped notch; these protuberances are minutely roughened. The outer pleural appendage is small and slender, provided with long hairs; inner pleural appendage with the caudal basal angle produced caudad

into a flattened spatulate blade whose apical portion is very thin, narrowly blackened and minutely denticulate.

Habitat.—Sierra Leone.

Holotype.—♂, November, 1904, (Major F. Smith). B. M. No. 1904–347.

Type in the collection of the British Museum (Natural History).

Tipula alphaspis nyasæ, subsp. n.

Female.—Length about 30 mm.; wing 25.4–26 mm.

Closely related to typical *alphaspis* Speiser (East Africa) differing as follows:

Mesonotal præscutum light yellow, the three stripes grayish brown, heavily margined with dark brown; the broad median stripe split by a median brown vitta that becomes obsolete behind; scutal lobes similar to the præscutal stripes, heavily margined with dark brown; scutellum yellow, the lateral wings dark brown; postnotum light yellow with two indistinct brownish lines near the sides of the median sclerite; typical *alphaspis* has this sclerite brown with an orange-yellow median line. Pleura bright yellow. The ovipositor with the valves long and straight, the tergal valves very slender, the sternal valves more compressed. The claws of the female are simple as in this sex of the present group of species.

Habitat.—Nyasaland.

Holotype.—♀, Mt. Mlanje, January 1, 1913, (S. A. Neave).

Paratopotype.—♀, January 28, 1913; a broken ♀, bred from the pupa, November 6, 1913.

Presented by the Entomological Research Committee 1913–236; Imperial Bureau of Entomology 1915–58.

Type in the collection of the British Museum (Natural History).

Tipula leonensis, sp. n.

Size large (wing of male over 25 mm.); generally similar to *T. gaboonensis* but smaller; mesonotum with dark brown spots on the sides of the præscutum and postnotum; abdominal segments dark brown, the intermediate tergites with yellowish basal areas on the sides; male hypopygium with the ninth tergite produced into a median lobe which is shallowly notched medially.

Male.—Length 23 mm.; wing 26.5 mm.

Frontal prolongation of the head light orange; mouth-parts and palpi dark brown; tips of the latter broken. Antennæ with the scapal segments bright orange; flagellum dark brown; antennæ short; flagellar segments with very long, conspicuous bristles. Head orange, the vertex narrowed between the large eyes.

Mesonotal præscutum obscure yellow with four dark brown stripes, intermediate pair narrowly separated from one another by a capillary line; lateral stripes broad; on the sides of the præscutum opposite the anterior ends of the lateral stripes, a large, rounded dark brown spot; scutum yellow, each lobe with two confluent, dark brown spots on the anterior proximal half; scutellum dark; postnotum dark brown, the lateral sclerites obscure yellowish, the centres with a very large, rounded brown area. Pleura yellow. Halteres dark brown. Legs with the coxæ and trochanters dull yellow; femora and tibiæ brown, the tips scarcely darkened; tarsi long, dark brown; claws of the

male toothed. Wings with a strong brownish tinge, costal cell more yellowish, subcostal cell dark brown; stigma elongate, dark brown; narrow brown seams along *r-m* and the deflection of R_{4+5} and another along the basal deflection of Cu_1; a brown spot at the region of the arculus. Venation about as in other members of this characteristic group of species; *Rs* short, about equal to R_2; cell R_2 very narrow, its inner end pointed; cells *1st* M_2 and M_1 large; petiole of cell M_1 short, subequal to *m;* fusion of M_3 and Cu_1 about one-half of *r-m*.

Abdomen discoloured; apparently dark brown, the lateral basal portions of tergites two to five yellowish; tergites six to eight uniformly dark; sternites somewhat similar; hypopygium yellowish. Male hypopygium with the ninth tergite produced medially into a broad lobe, the apex of which is provided with a rather small, V-shaped notch, the lateral lobes inconspicuous; the apex of this median lobe is broadly blackened and the entire tergite, except the base, is covered with numerous, subappressed, yellowish hairs; viewed laterally, each lateral lobe is seen to be produced ventrad into a minute blackened tooth. Outer pleural appendage broadly circular in outline, pale, a little darker near the base, the surface covered with a dense, appressed, silken pubescence of a yellow colour and a lessser number of coarse, black hairs. Inner pleural appendage not jutting conspicuously caudad as in *T. gaboonensis*. Ninth sternite narrowly but profoundly incised on the median line, near the dorsal proximal angle with numerous long reddish setæ. Eighth sternite unarmed.

Habitat.—Sierra Leone.

Holotype.—♂, collected by W. G. Clements, No. 93–20.

Type in the collection of the British Museum (Natural History).

Tipula leonensis is closest to *T. gaboonensis* Alexander (Gaboon to Southern Nigeria) but differs sufficiently in the smaller size, the different pattern of the thorax, such as the increased size of the lateral spots on the præscutum and postnotum, and, especially, the structure of the male hypopygium.

Tipula ellioti, sp. n.

General coloration orange-yellow, the præscutum and scutum with grayish brown stripes that are narrowly margined with still darker brown; a small brown spot on the lateral margin of the præscutum; abdomen yellow and black; male hypopygium with the median lobe of the tergite very broad, depressed, the caudal margin gently concave; pleural appendage very complicated in structure.

Male.—Length 20 mm.; wing 22 mm.

Frontal prolongation of the head moderately elongate, orange-yellow, the nasus slender; mouth-parts and palpi dark brown. Antennæ with the scape yellow, the flagellum brownish black. Head orange-yellow.

Thorax orange-yellow, the mesonotal præscutum with three dark grayish brown stripes that are narrowly marginal with still darker velvety-brownish black; anterior half of the median stripe split by a blackish line; a very small, rounded brown spot on the sides of the præscutum opposite the anterior ends of the lateral stripes; sides of the pronotum with an indistinct darker spot; scutal lobes grayish brown margined with darker, the median area broadly yellow; scutellum yellow, the lateral portions darker; the juncture between the scutellum and lateral sclerites of the postnotum dark brownish black; postnotum yellowish

with a pale brown blotch on either side of the median sclerite, the lateral sclerites unmarked. Pleura orange-yellow. Halteres brown, the base of the stem yellowish. Legs with the coxæ orange, the outer face of the fore coxæ slightly infuscated; trochanters orange; remainder of the legs broken. Wings with a grayish tinge, cell *C* faintly yellowish, cell *Sc* more strongly so; stigma brown; a brown seam along the basal deflection of Cu_1; veins dark brown. Venation: *Rs* almost straight, much longer than R_{2+3} and not in alignment with it; petiole of cell M_1 a little shorter than *m;* fusion of M_3 and Cu_1 punctiform.

Abdomen with the basal tergites narrowly blackish laterally, less distinctly darkened medially; fourth to sixth tergites brownish yellow, the lateral margins broadly black except at the base, the median area with an elongate black triangle with the point directed backwards; seventh and eighth tergites black; hypopygium reddish yellow; sternites uniformly yellowish, the seventh sternite with the posterior lateral angles blackened; eighth sternite medially at the base and laterally at the outer angles, blackened. Male hypopygium with the sclerites fused into a continuous ring as in the subgenus; median lobe of the tergite very broad, depressed, the caudal margin gently concave and set with numerous small blackened spicules; the sides of this lobe are provided with long yellowish bristles that are longest at the posterior lateral angles of the tergite. Pleural suture well indicated beneath; pleural appendages united into a single highly-complicated structure; what seems to correspond to the outer pleural appendage is a bifid lobe with the arms densely hairy; the inner appendage is produced into an outer chitinized spine, and intermediate flattened blade and an inner powerful compressed arm that juts toward the ninth tergite and corresponds to this inner blade in less specialized species; the inner face of this blade is covered with numerous, short bristles; the cephalic apex is rounded. Ninth sternite with only a shallow median notch, the remainder of the median area being filled with a pale membrane; proximo-caudal angles with a coarse pencil of reddish bristles that are decussate across the median line. Eighth sternite unarmed.

Habitat.—Uganda.

Holotype.—♂, Salt Lake to Wawamba (G. F. Scott Elliot) No. 95–41. Type in the collection of the British Museum (Natural History).

Tipula ellioti bears a general resemblance to *T. kenia*, but is a very different fly. It is named in honour of its collector, the distinguished Botanist, Dr. G. F. Scott Elliot.

Tipula kenia, sp. n.

General coloration orange-yellow, the mesonotal præscutum with three broad, shiny black stripes; scutal lobes largely black; male hypopygium with the median lobe of the tergite short and with a small, rounded median notch.

Male.—Length about 15 mm.; wing 17.2 mm. Hing leg, femur 11.5 mm.; tibia 13.5 mm.

Female.—Length about 20 mm.; wing 18.8 mm.

Frontal prolongation of the head obscure yellow, moderately long; palpi dark brown. Antennæ with the scapal segments obscure yellow, the flagellum broken. Head orange-yellow.

Pronotum orange-yellow. Mesonotal præscutum yellow with three con-

spicuous, shiny black stripes, the lateral stripes anteriorly subcontiguous with the median stripe; scutum yellow, the lobes largely shiny black; scutellum and postnotum light yellow. Pleura yellow; an obscure brownish area beneath the wing-root and surrounding the base of the halteres; mesosternum faintly brownish. Halteres long and slender, dark brown. Legs with the coxæ and trochanters reddish yellow; femora obscure yellow, the tips black; tibiæ brown, the tips narrowly dark brown; tarsi dark brown. Wings with a grayish yellow tinge, the costal cell light yellow, the subcostal cell a little darker; stigma elongate, medium brown; veins dark brown. Venation as in the subgenus; *m-cu* present.

Abdomen with the basal tergites yellowish, longitudinally striped medially and less distinctly laterally with jet-black, these three lines narrowly connected across the caudal margin of the segments; segment five largely black, the tergite narrowly, the sternite more broadly, reddish at the base; segments six and seven black, excepting the extreme base; segment eight reddish, the tergite darker laterally and with a narrow, clear-cut median line, the sternite broadly darkened laterally and medially; hypopygium bright orange. Male hypopygium with the sclerites fused into a continuous ring; tergal region very narrow, the median area slightly produced caudad and with a rounded median notch, the blunt lateral lobes thus formed directed slightly proximad and densely set with short, blackened spinules. Outer pleural appendage rather narrow, narrowed at the base and apex, the latter bluntly rounded, the outer face of the appendage sparsely provided with moderately long bristles; inner pleural appendage moderately complicated in structure, divided into two arms, the cephalic arm compressed into a blade, the posterior arm more slender. Ninth sternite with a deep median incision filled with membranous tissue, the caudal proximal angles provided with a brush of long hairs. Eighth sternite unarmed.

Habitat.—East Africa.

Holotype.—♂, South-eastern Slopes of Mt. Kenia, British East Africa, altitude 6,000–7,000 feet, February 3–12, 1911, (S. A. Neave).

Allotype.—♀, Mt. Rungwe, near New Langenburg, ex-German East Africa, altitude 5,000–6,000 feet, November 18–21, 1910, (S. A. Neave).

Type in the collection of the British Museum (Natural History).

The female that is referred to this species has the antennal flagellum black; the median præscutal stripe narrowly split behind by a capillary pale line; the subterminal abdominal segments are narrowly ringed basally with obscure yellowish; seventh tergite yellow, narrowly but conspicuously margined laterally and caudally with black; ovipositor with the tergal valves very slender and divergent as in this group of species, the sternal valves much shorter and compressed.

Tipula neavei, sp. n.

Head orange; general coloration deep velvety-black, including the postnotum; sides of the scutellum and a large circular area surrounding the base of the halteres pale yellow; legs brownish black; wings subhyaline, the costal and subcostal cells scarcely darkened.

Female.—Wing 16.2 mm. Middle leg, femur 10.5 mm.; tibia 10.8 mm.

Frontal prolongation of the head light orange, nasus slender, with long

black hairs; mouth-parts and palpi dark brown. Antennæ with the scape orange; flagellum dark brownish black; flagellar segments slender, elongate-cylindrical, with long verticils. Head orange; vertex between the eyes more brownish.

Pronotal scutum dark brownish black; scutellum paler. Mesonotum deep velvety black, the præscutum narrowly margined anteriorly with pale yellow; lateral wings of the scutellum whitish. Mesonotum covered with an abundant, short, subappressed pubescence. Pleura deep black, the dorso-pleural membrane buffy-yellow; a large, circular, pale yellow area surrounding the base of the halteres. Halteres dark brown, the base of the stem narrowly pale. Legs with the outer faces of the coxæ blackened; trochanters yellowish testaceous; femora dark brownish black, paler basally; tibiæ brown, the tips darker; tarsi brownish black. Wings subhyaline, the costal and subcostal cells scarcely brighter; stigma elongate, brown; veins dark brownish black, slender but clearly defined; an obliterative area before the stigma, continued across the basal deflection of M_{1+2} and the outer deflection of M_3. Venation: *Rs* moderately long, slightly arcuated at origin, a little shorter than R_{2+3}; deflection of R_{2+3} and *r-m* in alignment; *m-cu* obliterated by the very short fusion of M_3 and Cu_1.

Abdomen broken, only the terminal six segments preserved, the fourth to seventh deep velvety-black, the eighth and ninth reddish horn colour. Ovipositor with the tergal valves slender, curved slightly ventrad; sternal valves much shorter, the apices obtusely rounded.

Habitat.—Uganda.

Holotype.—♀, Ankole-Toro Border, east of Lake George, altitude 4,500 feet, October 20–21, 1911, (S. A. Neave).

Presented by the Imperial Bureau of Entomology, 1915–57.

Type in the collection of the British Museum (Natural History).

The opaque black mesonotum without markings and clothed with an abundant, nearly appressed pubescence, gives this handsome fly a very characteristic appearance.

Tipula ruwenzori, sp. n.

General coloration black; head orange-red; mesonotal præscutum shiny yellow with three very broad, black stripes; postnotum light yellow; abdomen brownish black.

Female.—Length 18 mm.; wing 16.8 mm. Fore leg, femur 9.8 mm.; tibia 11.4 mm. Hind leg, femur 11.1 mm.; tibia 12.8 mm.

Somewhat similar to *T. neavei* but readily distinguished as follows: Antennæ shorter. Mesonotal præscutum shiny yellow with three broad, shiny black stripes, only the narrow interspaces and the humeral and lateral margins being of the ground colour; scutum and scutellum entirely black; postnotum with the median sclerite conspicuously light yellow, the extreme caudal margin narrowly darkened. Pleura entirely dark brown, the mesepimeron with an indistinct yellowish cast. Wings slightly more brownish, especially the costal and subcostal cells; veins with short but conspicuous macrotrichiæ. Venation: section of vein M_{1+2} between *r-m* and *m* strongly arcuated; petiole of cell M_1 about equal to *m;* fusion of M_3 and Cu_1 very slight, less than one-half *r-m*.

Abdomen dark brownish black, without definite marks of paler, the genital segment and ovipositor reddish horn-colour.

Habitat.—Uganda.

Holotype.—♀, Mt. Kokanjero, Southwest of Elgon, altitude 6,400 feet, August 9, 1911, (S. A. Neave). B. M. No. 1913–140.

Paratype.—♀, Ruwenzori, altitude 6,000–8,000 feet, December (G. F. Scott Elliott). B. M. No. 95–41.

Type in the collection of the British Museum (Natural History).

Tipula ruwenzori ankolensis, subsp. n.

Very close to the typical variety described above, differing as follows: Vertex with a conspicuous brown mark adjoining the inner margin of the eye; mesonotal præscutum almost entirely black, the yellow interspaces being greatly reduced or obliterated; postnotum with a large brownish spot on either side near the caudal margin; a yellowish spot on the dorsal portion of the mesosternum between the fore and middle coxæ. Abdominal sternites two to four with a large, obscure orange blotch, not evident in the paratype.

Habitat.—Uganda.

Holotype.—♀, Western Ankole, altitude 4,500–5,000 feet, October 10–14, 1911, (S. A. Neave).

Paratopotype.—♀.

Type in the collection of the British Museum (Natural History).

DR. W. J. HOLLAND ON "THE CANADIAN ENTOMOLOGIST."

At the meeting of the Entomological Society of America, held at St. Louis, Mo., on the 30th of December, 1919, Dr. W. J. Holland, Director of the Carnegie Museum, Pittsburg, Pa., delivered the annual address. His subject was "The Development of Entomology in North America." At the close of his interesting address, he thus referred to the "Canadian Entomologist":—

"In these times of strife and discord it is a pleasure to recall how fraternal have been the relationships which have been maintained by all workers in our special field of inquiry. I desire especially to emphasize the cordial relationships which have been maintained during all these years between students living south of the St. Lawrence with those living north of that river. One of the best of all the entomological journals on the Continent is the "Canadian Entomologist." As it is one of the oldest, so it is one of the best-sustained publications of its kind. "The Entomological Society of Ontario" is a splendid organization, in which most of the leading workers within the United States have felt it an honor to have membership. For all practical purposes the entomologists of British North America and the United States form one united brotherhood. Behold how good and pleasant it is for us thus to dwell together in unity! May I not express the hope that the friendly relationship which has so long been maintained among us may remain indissoluble, and the same spirit which has prevailed between these two great bodies of workers in the New World may extend to all brotherhoods of other nations, and that through our scientific friendships we all may help to bring in the reign of universal peace, the thought of which is dominant among us and is emphasized by the anniversary of the birth of The Prince of Peace, which we have just celebrated."

NEW SPECIES OF LEPIDOPTERA.

BY J. McDUNNOUGH.
Entomological Branch, Dept. of Agriculture, Ottawa, Ont.

NOCTUIDÆ.

Agrotinæ.

Euxoa scholastica, sp. nov.

Male antennæ shortly serrate and fasciculate. Palpi, head, thorax and primaries brown, more or less suffused with pale ochreous, especially the palpi, head, bases of tegulæ and patagia and basal portion of primaries: a partial black line across the front and a better defined one crossing the middle section of the collar. Maculation of primaries very similar to that of *messoria* Harr. but better defined; basal and t. a. lines black, geminate, filled with ochreous, the latter upright, consisting of five scallops: orbicular an even, small oval, outlined with black and filled with ochreous: reniform edged with pale ochreous, especially prominent on outer margin, and filled with a shade corresponding to general colour of wing; median shade fairly distinct, bent outward along lower edge of reniform and then parallel to t. p. line; t. p. line dentate, geminate, black, inner line most prominent, ochreous filled, scarcely bent in below cell; s. t. line irregular, pale, defined inwardly by dark shades; a broken dark terminal border. Secondaries in both sexes smoky brown, slightly paler in basal half with distinct discal dot. Beneath primaries smoky, paler ochreous along costal and inner margins, with traces of postmedian line, well marked on costa, and a small discal dot; fringes concolorous; secondaries whitish, sprinkled with smoky along costa with broad bent postmedian line and dark discal dot, fringes pale, terminal broken dark line on both wings. Expanse 35 mm.

Holotype—1 ♂, Meach Lake, Que., July 24, (C. H. Young) in National Collection, Ottawa.

Allotype—1 ♀, Ottawa, Ont., Aug., 1904, (A. Gibson) in National Collection, Ottawa.

Paratype—1 ♂, Trenton, Ont., July 25, (J. D. Evans) in National Collection, Ottawa.

The species has been generally confused with *messoria* but may be most readily separated by the darker colour of the secondaries and the evenly oval, pale filled orbicular. The ♂ genitalia of the two species, of which figures are given, are closely related; in *messoria* however there is a certain amount of asymmetry between the bifid harpes, the outer branch of the left side being distinctly shorter and chunkier than the corresponding one on the right side; in the new species these are longer and subequal., The inner branch of the harpe in *messoria* is smooth with a few stray bristles whilst in *scholastica* the distal half is thickly covered with a clothing of fine short hairs. The most marked difference is in the aedoeagus as may be seen by a reference to the figures. The species appears to be widespread in the east but rather rare; specimens from New Brighton, Pa., are in the Barnes Collection and were

Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa, Ont.
June, 1920

separated out several years ago, but not described as the material was scanty and not in the best of condition. The exact position of the species is doubtful, and it may be that it fits in better in the *pestula* group than with *messoria*.

Cuculliinæ.

Feralia columbiana, Sm.

This species was described (1903, Can. Ent., XXXV, 9) from two males, one from New Westminster, B.C., (Fletcher), the other labelled North West Territories from Dr. R. Ottolengui. The first mentioned specimen, which is in the collection of the U. S. National Museum, must be considered to be the type. It was originally associated by Dr. Smith with *comstocki* Grt., and has the same type of secondaries with pale shadings at base and along outer margin. On this account, after an examination of the type, it was listed in the Barnes and McDunnough Check List as a race of *comstocki*, although it may quite probably prove to be a good species. The cotype from the Ottolengui collection recently came into the possession of Dr. Wm. Barnes, of Decatur, Ill., and at the time struck me as being distinct specifically from *columbiana* as typified by the Washington specimen; the almost entirely dark secondaries pointing, to my mind, to a close relation with *jocosa* Gn. Specimens of both forms exist in the Ottawa collection, and I have prepared slides of the male genitalia and find my suspicions that two species were involved verified. The following description of the new species is therefore offered.

Feralia deceptiva, sp. nov.

Male antennæ orange: palpi deep black; front pale greenish, shaded at vertex with black: thoracic vestiture pale green marked with black at base of tegulæ and along upper margin of patagia; two anterior and two posterior black patches on mesothorax; a black patch on lower edge of patagia: metathorax with black tufts; abdomen blackish with apical segment tufted with ochreous: pectus and venter black; legs with femur covered with long greenish hairs: tibiæ black, spotted with green and with green hair tufts along outer margin. Primaries blue-green, similar in shade to *jocosa*, crossed by heavy black lines which are white-bordered; costa and cubitus to end of cell white; basal line black, edged inwardly by white, more or less joined to t. a. line along costa and inner margin, enclosing an irregular, green, kidney-shaped patch; t. a. line heavy, black, bordered outwardly with white, with strong outward scallop below cubitus, bent back to near base of wing at inner margin; median shade black, touching outer edge of orbicular, then bent back to near t. a. line and forming an outward tooth on anal vein: orbicular oval, edged with black, then with white and filled with green; below it an indistinct wedge-shaped mark indicates the claviform; reniform broad, open above and below, laterally outlined with black and white, with two black streaks extending from apex and base of outer margin half-way to t. p. line; above reniform on costa three black dots separated by white; t.p. line arising from a diffuse black costal shade, strongly bent inwards, and dentate below cell, black, bordered inwardly with white, joined to anal angle by an oblique black streak: small terminal row of black dots: fringes checkered black and white. Secondaries almost wholly black-brown with

Male genitalia of (1) *Feralia columbiana* Sm.; (2) *F. deceptiva* McD.; (3) *Euxoa scholastica* McD.; (4) *E. missoria* Harr.; (5) *Orthonama evansi* McD.; (6) *O. obstipata* Fabr.

faint pale shading at anal angle. Beneath black-brown shaded with pale greenish with an even broad, green, marginal band on primaries and a narrower irregular one on secondaries: primaries with traces of the dark lines of upper side: secondaries with large discal dot and faint median and postmedian lines; fringes as above. Expanse 42 mm.

Holotype—1 ♂, Vancouver, B.C., April 22, (Bush) in National Collection, Ottawa.

Paratype—1 ♂, Vancouver, B.C., April 16, in same collection.

Genitalically *deceptiva* is so close to the eastern *jocosa* as to almost warrant it being treated as a geographical race; on account of certain small differences in the uncus, combined with the much greater size of the insect I treat it for the present as distinct.

The species is more robust than *columbiana* and lacks the suffused dark and pale shades in the subterminal area, the secondaries are also, as already mentioned, much deeper in colour. The genitalia of the two species are of the same general type, but the armature of the aedoeagus at once separates them. I doubt whether the generic term *Momophana*, proposed for *comstocki* will hold as distinct from *Feralia:* the separation was made by Grote on the size of the eyes, but this appears to vary in individual specimens of a single species: at all events *columbiana* seems not out of place in *Feralia* on genitalic characters. I have, however, at the present time no males of *comstocki* for examination and must, therefore, leave the question of its generic position, as well as its relation to *columbiana*, open.

GEOMETRIDÆ.

Larentiinæ.

Orthonama evansi, sp. nov.

Male antennæ rather lengthily ciliate: palpi, head and thorax light ochreous sprinkled with rusty brown: abdomen ochreous with a double dorsal row of black dots. Primaries light ochreous with veins outlined in rusty brown, especially prominent in subterminal area: a broad band of purplish gray crosses the middle of the wing, broadest at costa, where it is bent somewhat outward; the inner edge is formed by an upright brown line, the outer edge is bordered by a similar line, strongly outcurved at costa and then somewhat inwardly oblique and very faintly crenulate to inner margin: a discal spot surrounded by a somewhat paler shade is situated near the inner edge. Between this median band and the base of wing are some half-dozen waved rusty-brown upright lines, the most prominent, representing the t. a. line, being geminate, white-filled and with strong outward tooth below cubitus. Beyond the median band the pale subterminal area is crossed by two crenulate brown lines, arising from a diffuse costal shade of similar colour and in course parallel to the outer margin of the band; t. p. line geminate, inner line deep brown, outer lighter, white-filled, crenulate, parallel to the preceding lines, followed by a rusty-brown shade, most conspicuous opposite cell, this shade being bordered outwardly by a crenulate brown s. t. line: terminal space shaded with light-gray with geminate black terminal points and a dark brown oblique apical dash extending from apex of wing to the brown subterminal shade. Secondaries pale with

distinct bent, smoky, median line preceded by small discal dot; a crenulate geminate t. p. line. Fringes on both wings rusty-brown in basal half, paler outwardly. Beneath pale with distinct discal dots on all wings and the extracellular maculation of the upper side repeated very distinctly, the median band being however absent. Expanse 20 mm.

Holotype—1 ♂, Trenton, Ont., June 22, (J. D. Evans) in National Collection, Ottawa.

Allotype—1 ♀, Trenton, Ont., June 15, (J. D. Evans) in National Collection, Ottawa.

Paratypes—1 ♂ Hull, Que., June 20, and 1 ♀, Trenton, Ont., Aug. 3, (Evans) in the same collection.

The species has been probably confused in collections with *obstipata* Fabr., but can be distinguished by the similarity of colour in the two sexes and by the well-defined brown veining in the subterminal area. The genitalia (which are figured) are quite distinct from those of *obstipata*. I take pleasure in naming the species after the collector, Mr. J. D. Evans, one of the pioneer entomologists of this country, whose collection is now incorporated in the Canadian National Collection.

Geomètrinae.

Melanolophia centralis, sp. nov.

Very similar to *imitata* Wlk. in colour and maculation but differing obviously in ♂ genitalia. Primaries heavily sprinkled and shaded with purplish-brown over a pale ochreous base. T. a. line deep purple brown, single, with two prominent outward bulges, one in the cell, the other below cubital vein: median line similar in colour, upright, arising from small costal blotch and with rather prominent outward angle on cubitus; t. p. line indistinctly geminate, strongly scalloped, the points resting on the veins, bent in below the cell and approached to median line on inner margin, bordered outwardly by faint pale line beyond which is diffuse dark shading; small discal dot; s. t. line faint, composed of series of dark dots, subparallel to outer margin, preceded by faint pale shades, most prominent opposite cell and at inner margin: terminal area with faint dark shade opposite cell; terminal series of black points: fringes concolorous. Secondaries paler with traces of curved median and t. p. lines and distinct subterminal row of dots. Beneath pale silky grey with minute discal dots on all wings: costa of primaries and line at base of fringes slightly ochreous. Expanse 40 mm.

Holotype—1 ♂, Jemez Spgs. N.M., (Apr. 8–15) in Coll. Barnes.

Paratypes—6 ♂'s, 1 ♀, Glenwood Spgs., Colo., (May) in Coll. Barnes and in National Collection, Ottawa.

The most readily recognizable structural difference between the present species and *imitata* Wlk. is found in the male genitalia: in the latter species what may be provisionally termed the harpe is composed of a heavy bunch of subequal spines situated at the apex of the sacculus; this is modified in our new species to one very long stout spine with a few small ones gathered around its base. In connection with a study of the North American Boarmiids I hope to publish at a later date figures of the genitalia of this and allied species.

CANADIAN MYRIOPODS COLLECTED IN 1882-1883 BY J. B. TYRRELL, WITH ADDITIONAL RECORDS.

BY RALPH V. CHAMBERLIN,
Museum of Comparative Zoology, Cambridge, Mas.

Among material sent to me for identification from the Canadian Geological Survey is a small collection made by J. B. Tyrrell in 1882-1883 which is of much interest in containing a new Scytonotus from British Columbia, a new Conotyla from Alberta and a new Parajulus. In addition to the forms collected by Tyrrell, some other species collected by F. Johansen in 1917 and 1918, one taken by J. A. Salter and one by R. Wells are also here listed.

Chilopoda.

1. **Geophilus rubens** (Say.)

One specimen taken at Ottawa June 3, 1882, by Tyrrell.

2. **Lithobius forficatus** (Linné.)

Specimens taken at Ottawa in 1917 and 1918 and on St. Joseph's Id., Ontario, Sept. 3, 1918, by F. Johansen.

3. **Sonibius politus** (McNeil.)

One specimen taken at Ottawa, June 3, 1882, by Tyrrell.

Diplopoda.

4. **Polydesmus serratus** (Say.)

One male taken by R. Wells in 1883 on Gaspé Penninsula, Quebec, "interior," and others at Ottawa and Chelsea, summer of 1918, by F. Johansen.

5. **Scytonotus columbianus,** sp. nov.

At once separable from *S. bergrothi* Chamberlin, known from Bremerton, Washington, in its obviously smaller size, which approaches more nearly that of *S. granulatus* Say. As in the latter species the colour is horn brown with a tendency toward reddish. The female may be distinguished in having the keels of the eighth and ninth segments of normal size or very nearly so, not absent or nearly so. The male differs in the details of the gonopods, the anterior prong, e. g., in lateral view appearing more slender and finely tapered and curving much farther beyond the end of the posterior branch,

Fig. 16.—*Scytonotus columbianus*, sp. nov. Gonopod of male, right side, ectal view.

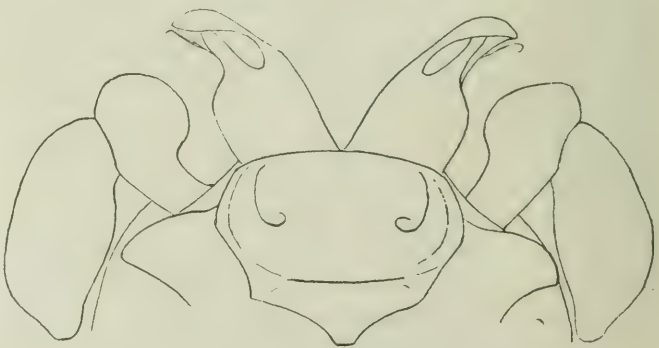

Fig. 17.—*Conotyla albertana*, sp. nov. Gonopods of male, anterior view.

which also differs in details (see fig. 16). Correlated with the normal develop-

ment of the keels of the eighth and ninth segments of the female, processes from the penult segment of legs thirteen to seventeen, etc., as occurring in *granulatus*, are absent or obsolete in the male of the present species.

Length of male type near 10 mm. The female is larger and more robust.

Locality.—British Columbia: "Columbia Valley." Male type taken by Tyrrell Sept. 26, 1883. The two female paratypes were taken by Tyrrell Sept. 1, 1883, the locality label reading simply "Swamp, tobacco plain," probably in or near the Columbia Valley.

6. Conotyla albertana, sp. nov.

Light gray brown to light brown of reddish cast, especially above. A black stripe along each laterodorsal side across keels and median dorsal longitudinal black line. Anal tergite dark, valves dusky. Legs light brown or fulvous. Antennæ all missing. Ocelli in the male type in a subtriangular patch, twenty-two in five series: thus, 7, 6, 5, 3, 1. Ocelli of a female paratype twenty in four series: thus, 7, 6, 4, 3. Second legs of female with second joint strongly thickened distad, protruding on dorsal side distally in a conspicuous rounded lobe. In the male the fourth joint of the third, fourth and fifth legs with a short cylindrical, distally truncate, lobe beneath near distal end. Sixth legs lacking lobes. Legs followed seventh segment also lacking lobes. Anal scutum truncate, with the usual setæ. Anal valves posteriorly angulate, mesally margined. Gonopods of male shown in Fig. 17.

Locality.—Alberta, Bow River, Sept. 28, 1833, Tyrrell.

Resembles *C. atrolineata* Bollman, the types of which came from Glacier, B.C., but distinct in the form the gonopods and in the secondary modifications of the legs.

7. Julus caeruleocinctus (Wood.)

One specimen taken at Ottawa in summer of 1918 by Johansen.

8. Julus fallax, (Meinert.)

One male of this European species taken by Johansen at Ottawa in Apr., 1917, and several males and females at the same place in the summer of 1918.

9. Parajulus canadensis (Newport.)

One female taken by Johansen 20 May, 1917, at Meach Lake, Ottawa.

10. Parajulus venustus (Wood.)

Two females taken on St. Joseph's Id., Ontario, by Johansen, Sept. 3, 1918.

11. Parajulus perditus, sp. nov.

The type, a female, is an exceptionally dark form. Each ordinary segment has a very narrow fulvous stripe or line along the segmental suture with a blackish annulus bordering it in front and behind, the border regions of the somite lighter, more grayish. Dorsal region on anterior segments with more numerous small lighter areolations visible under lens as frequently. In the anterior region the body is lighter beneath and on the sides, more or less reddish. The paratype from Wigwam River is lighter, being reddish gray or in part fulvous gray on the sides and beneath throughout the length, with small, in part confluent, lighter areas included in the dark of prozonite above. In both specimens the collum is marked across anterior border by a black band widening to middle where it continues caudad as a median longitudinal black line; a

black line from anterior end of the median line runs on each side obliquely caudoectad; remaining part of collum covered by a dense network of black evident under lens. Vertex of head covered with similar black network; a solid black area between eyes and antenna with pale spot at base of each antenna as usual. Anal segment blackish. Legs light reddish brown. Antennæ blackish.

Vertigial sulcus strongly marked, joining a deep arcuate transverse sulcus running between the eyes.

Collum margined below and part way up anterior edge as usual. Lower end on each side well rounded. Above lower end on each side typically three longitudinal striæ of which the uppermost extends entirely across plate to the margining sulcus and the others nearly as far. Second tergite extending below level of collum, its infero-anterior angle produced below level of the posterior; less broadly and less decidedly produced than in *P. venustus* and especially than in *P. hewitti*, two species which it resembles.

Segmental suture strongly impressed; widely curving opposite the pore, which is widely removed from it. The metazonite on each ordinary segment longitudinally striate beneath and up the side to a little below level of the pore, the more ventral striæ crossing to the prozonite, but the prozonite otherwise nonstriate. The surface in general densely marked with minute shallow punctæ and short lines as in *hewitti*, *venustus*, etc.

The anal tergite is produced beyond the anal valves as in *hewitti* and *venustus;* but, unlike those species, the produced part in side view is seen to bend moderately but distinctly upward, instead of being straight or slightly depressed. The tip is not rounded as in *hewitti*, being decidedly angular as viewed from above, and is broader than in *venustus*. Valves margined as usual.

Number of segments 48–52.

Length about 33 mm.; width 2.5 mm.

Localities.—Waterton Lake. Type taken Aug. 24, 1883. A second female was taken July 25, 1883, on the Wigwam River. Tyrrell coll.

12. Spirobolus marginatus (Say.)

On specimen taken at St. Nicholas, Quebec, by J. A. Salter, and one at Renfrew, Ont., by Johansen.

ENTOMOLOGICAL BRANCH—DIVISION OF FOREST INSECTS

Bark-beetle control operations are nearly completed in the Coldwater Valley, B.C., and are now being carried out in the Spious Valley. In addition to the logging operations by which the infested timber is salvaged, hundreds of infested trees, on the mountain sides and in isolated positions, have been felled and burned so as to kill the broods of beetles in the bark, The slash from all this work will be burned during June. Last week Mr. Hopping gave an open-air lecture to the Dominion forest rangers at the Spious Creek camp, explaining to them, on the ground, helpful details regarding the infestation.

—Entomological Branch News Letter

Mailed June 25th, 1920.

The Canadian Entomologist

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POPULAR AND PRACTICAL ENTOMOLOGY.

The Contents of Our Entomological Journals During 1919.

BY HARRY B. WEISS,
New Jersey State Dept. of Agriculture, New Brunswick, N.J.

Entomological journals are mostly what contributing authors make them, and the following, which is a brief summary of the 1919 contents of eight journals devoted entirely to entomology, should, if nothing else, indicate in a general way, the trend of entomological thought and activity. Such a summary, however, will not give an adequate idea of all entomological activities nor of the amount of published material devoted to each branch of entomology, in view of the fact that no consideration has been given to the publications of experiment stations, departments of agriculture, colleges and universities nor to journals devoted only partly to entomology.

The title of this paper clearly indicates its scope, and nothing more nor less should be assumed. In the tables which follow it is not intended that one journal should be compared with another. They have been treated separately only for the sake of convenience, and their contents have been summarized by titles and not by the quantities of printed matter devoted to each subject. These journals range from four to twelve issues per year, are of different sizes, and employ types of various kinds, consequently a true comparison should include all of these factors. All are valuable, all serve a useful purpose, and all should be supported by entomologists.

With the exception of Psyche and the Journal of the New York Entomological Society, the complete 1919 volume of each has been summarized. In the case of the exceptions, the last 1919 numbers of which have not appeared at this writing, the last issue of 1918 was included in order to make a complete volume.

Table I indicates the number of titles on each subject or group of subjects in each magazine. In a few instances, single papers covered more than one subject, and in such cases the titles were placed according to the amount of material on each subject. As for example, if a paper contained 75 per cent. of taxonomic material and 25 per cent. of any other subject, it was placed in the group devoted to classification. However, most of the titles and subject matter fell readily into the classification as given in the tables. Table I further shows that papers on classification, including descriptions of new species and papers dealing with the various phases of systematic entomology, outnumber all others. Following this numerical order we have the biological papers, such as those dealing with the life-histories, habits and early stages of insects, and then the economic ones. Only one journal is devoted to economic entomology, and there are hundreds of economic papers published by agricultural

experiment stations, etc., so that the importance of the subject should not be measured by comparing the economic figures in Table I with the figures of other groups.

Papers on distribution, including host lists and those covering general entomology, are evidently of considerable interest to entomologists, judging by the number of titles devoted to each. The same is true for brief notes on all phases of the subject. Anatomical, morphological and physiological subjects are fairly well represented and will undoubtedly be more so in the future. Insect behaviour, ecology and origin are poorly represented, but papers on such subjects often appear in other journals, such as those devoted to animal behaviour and natural history in general.

TABLE I. NUMBER OF TITLES ON EACH SUBJECT.

Subjects	Canadian Entomologist, 12 issues.	Psyche, 6 issues.	Journal N. Y. Ent. Soc., 4 issues.	Entomological News, 10 issues.	Annals Ent. Soc. America, 4 issues.	Bulletin Brooklyn Ent. Soc., 5 issues.	Proceedings Ent. Soc. Washington, 9 issues.	Journal Economic Entomology, 6 issues.	Totals.
General economic methods, insecticides, etc.								26	26
Economic entomology							1	36	37
General subject	11			9		1	1		22
Classification, descriptions, new species, etc.	42	12	17	36	10	16	26		159
Distribution, faunal and host lists	8	5	2	6	2	3	1		27
Anatomy, morphology, physiology	3	3	2		5	1	2		16
Life history, habits, early stages, etc.	8	6	3	9	6	2		10	44
Behaviour		2						1	3
Origin				2		2			4
Ecology		1							1
Brief notes, all phases	20	2	13	23	1	6	4	33	102
Proceedings societies	1		3	15	1	4		3	27
Book reviews	11		1	6		5		9	32
Obituaries	2		1	6			3		12
	106	31	42	112	25	40	38	118	512

TABLE II, NUMBER OF MAJOR AND MINOR PAPERS IN ALL JOURNALS.

	Canadian Entomologist.	Psyche.	Journal N. Y. Ent. Soc.	Entomological News.	Annals Ent. Soc. Amer.	Bulletin Brooklyn Ent. Soc.	Proceedings Ent. Soc. Washington	Journal Economic Entomology.
Major papers	72	29	24	62	23	25	31	73
Minor papers, notes, etc.	34	2	18	50	2	15	7	45
Totals	106	31	42	112	25	40	38	118

In Table II the titles are further grouped into major ones, which include all of those listed in Table III and minor ones which include everything else,

various editorials and business proceedings. In view of this it is necessary for entomologists to support their journals in a more substantial manner, and one way of doing this is to subscribe for as many as one can afford. This is a duty which entomologists owe to their science. Moreover, the charges for such subscriptions are extremely low considering present-day prices, and each journal is well worth its price and more.

In one of the publications mentioned in the tables, which is also the official organ of an association of entomologists, the statement is made that "there were a considerable number of both active and associate members who did not subscribe for the publication." It is inconceivable that an active member of an association would refuse to support its journal. In some cases there might be extenuating circumstances, but it is believed that most entomologists can afford the small sums asked for their publications. The fact that a journal is not devoted exclusively to the entomological subject in which one is interested is not a valid excuse for failing to support it. The systematist, the economic worker, the insect ecologist, the insect biologist and the collector all need each other, and each should contribute to the other's support in order to advance the science of entomology.

A NEW SPECIES OF PSEUDACHORUTES (COLLEMBOLA).

BY CHARLES MACNAMARA,
Arnprior, Ontario.

The crystalline limestone that crops out in many places along the shores of Lac des Chats on the Ottawa River is often curiously eroded between the seasonal high and low water-marks into little circular cups with fairly vertical sides and rounded bottoms, ranging in size from about three to about eight inches in diameter by three or four inches deep. The cups occur only on horizontal surfaces, and are usually scattered in small groups rather widely separated; but occasionally a flat rock is so closely pitted with the depressions that it looks something like an enormous dilapidated honeycomb. The cups nearly always contain water, either from rain or from the splashing of the waves; and no doubt they are caused by the solvent action of water on the limestone, but why they should be so symmetrical in shape is not clear.

What concerns us here, however, is that these water-filled rock cups are great traps for some kinds of Collembola. Of course, the brisk, semi-aquatic *Isotoma palustris* Mull, which is at home on fresh-water shores all over the northern hemisphere, can leap nimbly in and out of the cups and play safely over the surface of the water. But any of the plodding Collembolan earth-walkers that blunder into the little hollows find them snares for their feet, and once caught on the water film, few of them ever seem to reach the rocky side and safety again.

So far I have collected nine different species and one variety of Collembola in the rock cups. Four are species common elsewhere in the district, but six of them—and this is what makes the cups such an interesting hunting ground—I have never found anywhere else, and of these at least two are new to science. One of the latter—a Pseudachorutes—is described in the present paper.

August, 1920.

The genus Pseudachorutes, Tullberg, belongs to one of the most generalized of the Collembolan families, the Poduridæ. Including the subject of this paper, it comprises as yet only nine species, five of which are reported from Europe and four from North America. Two or three additional species have been described by different authors, only to melt away into the synonymy that is so rife in Collembolan classification. At present the genus is recorded only from the north temperate zone, but they are rare insects, and future collecting will probably discover them in other parts of the world.

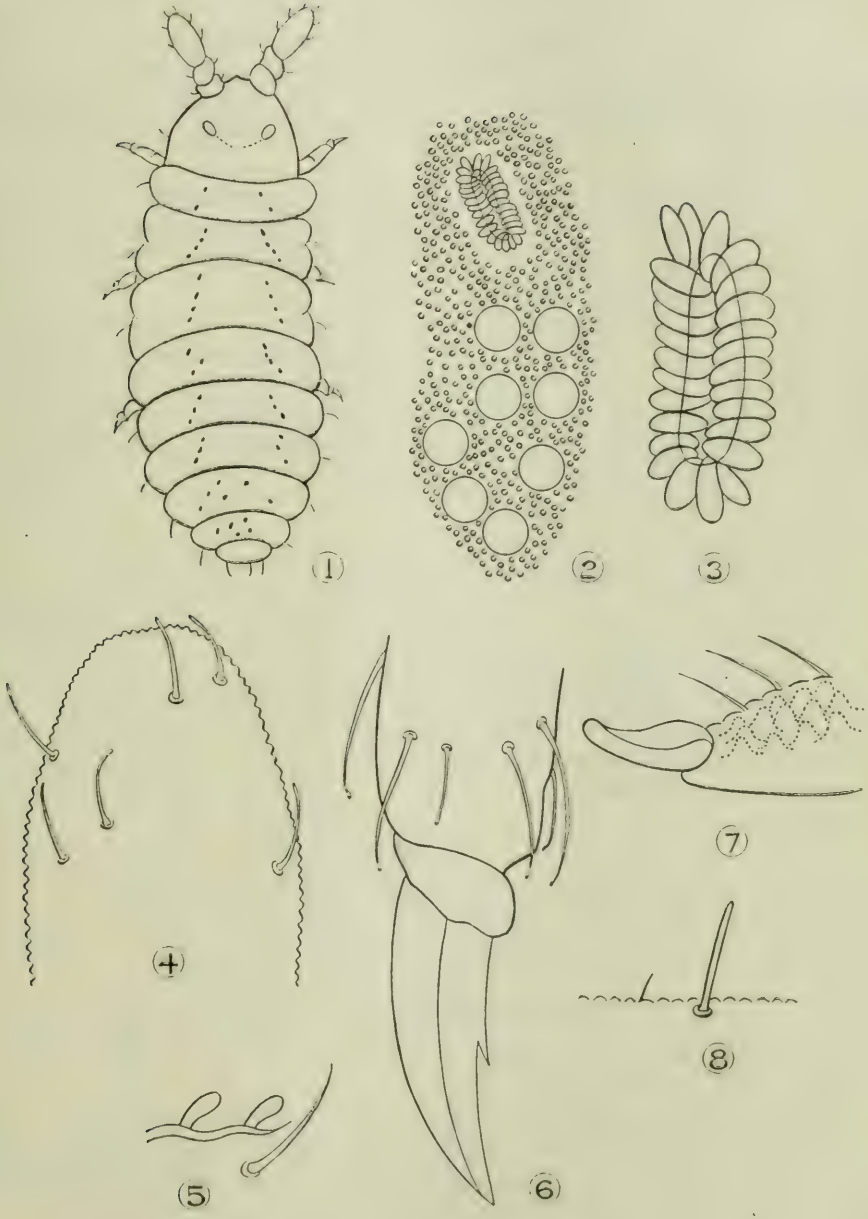
The name "*saxatilis*" given the species here described, is suggested by the insect's habit of frequenting the rocks where it becomes trapped in the water-worn cups. What attraction a moisture-loving Collembolan can find on the sun-baked wind-swept limestone is hard to understand. Like many other members of its order, this Pseudachorutes seems possessed of a *wanderlust* that gets it into trouble. It does not seem possible that it can live on these bare rocks, and a careful search under stones and in crannies near the rock cups failed to discover a single individual. The fifteen or twenty specimens I have collected were all found caught on the water in the cups. The "mother lode" of this supply has not yet been traced, but it is probably among the bushes and trees a few yards back from the shore. In this respect the name is inaccurate, for the next time the insect is taken it will probably be in dead leaves or under rotten bark. But scientific names are no more to be regarded as strictly descriptive than those of persons, and no one expects to find every John Smith hammering iron on an anvil.

Pseudachorutes saxatilis, n. sp.

Plate V. Figs. 1 to 8.

Colour light to dark lavender blue, finely mottled. Body sutures, legs and under parts lighter. Dividing the width of the back into about thirds, are two rows of small light spots which diverge a little caudally on each segment (Fig. 1). *Eye-spots* conspicuously black, particularly so in the lighter-colcured specimens. *Eyes* 8+8, equal (Fig. 2). *Postantennal organ* of about 28 oval leaves arranged in a long ellipse (Fig. 3). The number of elements varies from about 25 to 29. *Antennæ* sub-equal in length with head or slightly shorter. Third and fourth segments confluent dorsally, but suture shows ventrally. Relative lengths of segments vary a good deal in different individuals, but approximate 7 : 8 : 7 : 9. First segment about 1½ times wide as long, second segment about 1¼ times wide as long, third and fourth segments taken together about 2½ times long as wide. Fourth segment furnished with "olfactory" setæ (Fig. 4). Sense-organ of two clavate curving rods situated distal dorsally on third segment (Fig. 5). Antennæ bear many single setæ, sparse on first and second segments, numerous on third and fourth segments. *Buccal cone* relatively short. *Unguis* (Fig. 6) with one large tooth about one-third from base. No tenent hairs, but distal tibio-tarsal hairs are apically bent and minutely knobbed. *Furcula* short and stout. *Dentes* with many coarse dorsal tubercles distally. *Mucrones* (Fig. 7) about one-third as long as dentes, convex in outline, with rounded lamella extending about two-thirds of the length, apical third finger-like, ventral margin curved. Rami of *tenaculum* tridentate, corpus

CAN. ENT., VOL. LII. PLATE V.



PSEUDACHORUTES SAXATILIS, n. sp.

without ventral setæ. *Clothing* merely a row of short, blunt simple setæ across middle of each segment with a few minute setæ in addition (Fig. 8) Maximum length 1.5 mm. Found August to October trapped on water in little cups eroded in limestone on shores of Ottawa River at Marshall's Bay, near Arnprior, Ontario.

The most distinctive feature of this species is the long, elliptical, postantennal organ of numerous elements. While these elements are usually referred to as tubercles, in this instance when viewed in plan they look like flat, overlapping plates; in perspective they are seen to be somewhat inflated, outstanding, oval leaves.

The two rows of light spots down the back may also serve for a preliminary identification, and possibly these may prove to be a constant characteristic; but coloration is so unstable with many Collembolans that little weight should be given to their presence or absence.

It is a pleasure to acknowledge the generous help that Dr. J. W. Folsom, of the University of Illinois, has given me in separating this species. His criticisms and suggestions have been of the greatest assistance, and I am indebted to him for pointing out some of the morphological niceties that the average microscopist cannot see until he is told where to look for them.

EXPLANATION OF PLATE V.

Fig. 1. *Pseudachorutes saxatilis* x45.
2. Eyes and postantennal organ of left side. x350.
3. Postantennal organ. x730.
4. Olfactory setæ of right antennæ, dorsal aspect. (Undifferentiated setæ are omitted). x450.
5. Sense organ of third antennal segment. x1500.
6. Right hind foot. x730.
7. Right mucro and part of dens. x660.
8. First abdominal segment. x500.

A NEW *MYZOCALLIS* (APHIDIDÆ: HOMOPTERA).

BY W. M. DAVIDSON,
U. S. Bureau of Entomology, Alhambra, Calif.*

Myzocallis alhambra, sp. nov.

Body non-tuberculate; wings clouded; cornicles and tibial bases pale. Alate viviparous female.

General colour pale lemon yellow, suffused with pink and light orange. Shape of body rather narrow. Antennæ slender (third joint slightly enlarged on basal half), about as long as the body, pale yellow, articulations narrowly dusky brown; joint III bears from 2 to 4 circular sensoria on basal half; filament of distal joint longer than base; relative lengths of joints: III 317, IV 233, V 250, VI 133+186; joint IV is sometimes longer than joint V, and vice versa. Head and thorax somewhat dusky on sides; forehead produced obtusely in centre, its longest hairs about one-fourth as long as the head is wide between the antennæ, obscurely capitate; beak pale yellow, tip black, reaching barely to

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second coxæ. Thorax and abdomen without tubercles; wings clouded brown, veins brown, insertions of wing pale yellow, stigma pale yellow, a brown spot at base; legs pale yellow, tarsi grey; sternum dusky grey. Abdomen with many grey setiferous elevated maculations, these of greatest area being on the sides of segment 2 to 4 inclusive; cornicles pale, about as broad at the base as long, narrowingly apically; cauda and anal plate pale, the latter bifid. Venter pale.

The species varies in size considerably. Length from 1.4 to 1.8 mm., width (mesothorax) from .51 to .67 mm., length of cornicles .06 to .075 mm., length of cauda .12 mm.

Host.—*Quercus englemanni* Greeul, *Quercus* sp. On the leaves.
Locality.—Alhambra, Calif.

Dates of collection.—July 7, Sept. 26, November 5, 1919.

Type.—One slide containing four alate specimens deposited in the U. S. Nat. Mus. Collection of Aphididæ.

This species differs from *Myzocallis discolor* Monell in the structure of the third joint of the antennæ, *discolor* having about 8 sensoria placed all along the segment. In Monell's species the apical half of the venter is dusky, in *alhambra* the venter is pale.

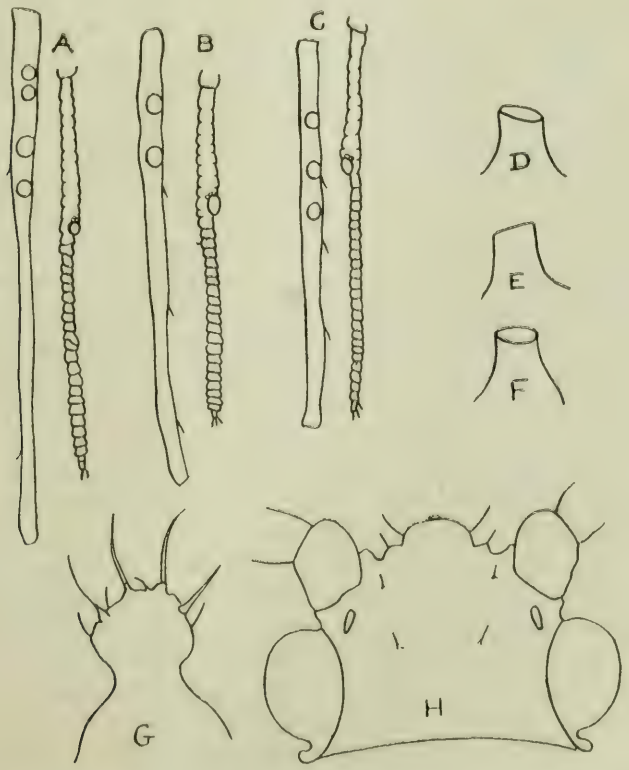


Fig. 18. A, B, C, segments III and VI of three antennæ; D, E, F, three views of cornicle; G, cauda; H, dorsum of head.

REMARKS ON THE BASIC PLAN OF THE TERMINAL ABDOMINAL STRUCTURES OF THE MALES OF WINGED INSECTS.

BY G. C. CRAMPTON, PH. D.
Massachusetts Agricultural College, Amherst, Mass.

The genitalia of male Hymenoptera, Neuroptera, Mecoptera, Diptera, Trichoptera, Lepidoptera, Hemiptera (Homoptera) and Strepsiptera have been compared with those of the lower orders in a paper which appeared in "Psyche," (June, 1920). The added knowledge gained from this study of a wider range of forms, and from an examination of the condition occurring in arthropods related to insects, together with the light thrown upon the nature of the parts in the lower insects in Dr. Walker's recent description of the genitalia of the male of *Grylloblatta campodeiformis* (Can. Ent., LI, 1919, p. 131) have enabled me to come to a better understanding of the fundamental composition of the terminal structures of the Hexapoda, and the following suggestions are here offered in an effort to clear up some of the uncertainties concerning the interpretation of the parts in insects in general and in the higher forms in particular.

Embryologists have maintained that the abdomen of an insect is primarily composed of twelve segments—or eleven segments, with a "telson"—and since the abdomen of the Protura (which are among the most primitive representatives of the Hexapoda) is composed of twelve segments, there is some evidence for considering that twelve is the original number of segments entering into the composition of the abdominal region of insects in general. It is only in exceptional cases, however, that traces of the structures interpreted as the vestiges of a twelfth segment are retained (as in certain odonatan nymphs), and the retention of even eleven complete segments is by no means of common occurrence in the lower pterygotan orders, since the eleventh tergite ("11" of Fig. 5) is usually lost through atrophy of fusion with the preceding tergites, though certain latero-ventral parts of the eleventh segment are frequently retained to form the so-called paraprocts "e" (Figs. 1 and 5) of lower insects.

The paraprocts "e" (Figs. 1 and 5) are usually much reduced, and unite with the tergites of the tenth or other segments to form the anal papilla or proctiger (a structure bearing the anus) in higher forms (Fig. 6, "h"). The paraprocts, "e", are represented as though distinct, in the diagram of the parts of a sawfly shown in Fig. 3; but this does not correspond to the actual condition occurring in any known sawfly, since the paraprocts in these insects usually form the floor (and sides) of the anus-bearing structure whose tergal region is made up largely of the tenth tergite which usually unites more or less closely with the ninth tergite in the sawfly group.

The cerci, "f", borne on the paraprocts "e" (Figs. 1, 3 and 5) are homologous with the multiarticulate flagelliform uropods of such Crustacea as the Tanaidacea (Chelifera). The exopodite, or outer branch of the biramous appendage forming the uropod, is sometimes wanting in these flagelliform uropods of the Tanaidacea, thus suggesting that when only one of the branches is retained, the endopodite, or inner one, remains to form the cerci of insects. When both branches of the uropod are retained in the Tanaidacea, they are borne upon a single segment or protopodite (if one may judge from the published figures of these structures, and from the condition exhibited by *Apseudes spinosus*) and on this account I have been led to conclude that Walker, 1919 (Ann. Ent. Soc.

America, XII, 1919, p. 267) is incorrect in adopting the method of designating the basal segment of the cerci as the "basipodite," proposed by the German entomologists. Furthermore, it is quite possible that the paraprocts themselves (or a portion of them) represent the basal region of the uropod (see Fig. 5, "e"), whose endopodite is represented by the cerci. If this be correct, we might also consider the styli-like "paraprocessi", or articulated processes borne on the paraprocts of certain tridactylids, as the representatives of the exopodite of the uropod whose endopodite forms the cerci of these insects.

The styli of insects apparently represent the exopodites of abdominal limbs, and if the paraprocessi also represent the exopodites of abdominal limbs (uropods) we would naturally expect that those paraprocessi would have the form of styli—as is true of the jointed paraprocessi of the tridactylids. On the other hand, the paraprocessi of certain Plecoptera are not styli-like, and the so-called suprahami (or surhami) of certain Blattida, which are somewhat suggestive of them, are not styli-like, being more like a hook—but the type of structure occurring in the Plecoptera might possibly be regarded as modifications of the original styli-like form. It may be remarked, in passing, that in some larvæ these styli have been interpreted as "cerci"; but this matter will be discussed eslewhwere.

The tenth tergite, "10^{t}", of Figs. 1 and 5, has been referred to as the "epiproct," or supraanal plate, when it is sufficiently well developed to be distinguishable, although the same term has also been applied to the eleventh tergite "11^{t}" in some cases. This is a somewhat lax application of the term epiproct, and Walker, 1919 (l. c.) is much more exact in restricting the designation epiproct or supraanal plate to the eleventh tergite. There is, however, an apparent need for some general designation for the last visible tergite no matter to what segment it belongs, and on this account I have here followed the more lax usage of referring to the apparent terminal tergite as the "epiproct" regardless of the segments involved in its make-up. In the sawflies, the tenth tergite "10^{t}" of Fig. 3 is usually more or less closely united with the ninth tergite, and in most higher insects it is difficult to identity its homologue. The sternum of the tenth segment is usually greatly reduced or atrophied, although it is claimed by some entomologists that the basal portion of the genital forceps "a" of Fig. 2, represents the tenth sternite in sawflies, etc. I think, however, that it is possible to interpret the structure in question in another way, as will be presently discussed. Heymons and others have maintained that lateral structures of the tenth segment form what appear to be the cerci in male Odonata, and there are sometimes present in certain phasmids, accessory lateral clasping organs which might be mistaken for cerci, though in reality they are merely posterior prolongations of the lateral region of the tergite.

Lateral portions of the ninth tergite may become prolonged posteriorly to form the surgonopods ("i" of Fig. 6) or accessory clasping organs of certain Neuroptera, Diptera and related forms, and have, in some cases, been mistaken for the true genital forceps when the latter are reduced and the surgonopods are well developed. The pleural region of the ninth segment labeled "9^{p}" in Fig. 6, has been homologized with the paraprocts "e" (Figs. 1, 3, 5, etc.) in certain higher insects; but the gonopleurite "9^{p}" of Fig. 6, is an entirely different structure, and should be designated by a term indicating this fact. The

sternite of the ninth segment is a structure of considerable interest from the fact that in the higher orders it forms the hypandrium "9^s" (Fig. 3) or ventral plate extending below the genital apparatus of the male insect, and its form and development offer features of some value in classification.

Behind the ninth sternite, or hypandrium "9^s" (Figs. 4 and 5) of the Ephemerida, there occurs a plate formed by the union of the "coxites" or styligers "a" and "a," which represent the basal segments of the gonopods or styli bearing the labels "b" and "c." The plate "a" and "a" of Fig. 4 is usually interpreted as the tenth sternite by students of the Ephemerida (Morgan, Eaton, et al.); but Handlirsch, 1913, (Handb. der Entomologie) figures the terminal structures of a male ephemerid *Palingenia*, in which the styligers of "coxites" (i. e., the parts labeled "a" in Fig. 4) are separate and distinct, and Walker, 1919 (l. c.) also points out that these "coxites" or styligers may unite to form the plate "a" and "a" behind the ninth sternite in the Ephemerida (Fig. 4). This interpretation is apparently the correct one, and has been adopted in the present discussion.

Between the styli or gonopods labeled "b" and "c" in Figs. 4 and 5 of the Ephemerida, there occurs a pair of penisvalvæ "d," through which the ejaculatory ducts open. In some insects, the common opening of the united ducts is located at or near the base of the penis valves. It is quite possible that the penis valves "d" represent the endopodites (inner branches) of a pair of abdominal limbs whose exopodites (or outer branches) are represented by the styli or gonopods labeled "b" and "c" in Figs. 2, 3, 4, etc. If this be correct, both the penis valves and the gonopods would have to be regarded as belonging to the same segment (the ninth) since they are parts of a pair of limbs borne on one segment. This interpretation has a direct bearing on the view that the inner and the dorsal valvulæ of the ovipositor of the female also represent the endopodites and exopodites of a pair of abdominal limbs, since it is quite possible that the penis valves of the male insect are homologous with the inner valvulæ of the ovipositor of the female; and the gonopods or styli of the male are homologous with the dorsal valvulæ of the ovipositor of the female insect. The penis valves of the male and the inner valvulæ of the ovipositor of the female would represent endopodites, while the styli (or gonopods) of the male and the dorsal valvulæ of the ovipositor of the female would represent exopodites of a pair of abdominal limbs borne on the ninth segment in both cases, according to this view; but Wheeler, 1893, (Jour. Morphol., VIII, p. 1) maintains that the inner valvulæ of the ovipositor, for example, are in reality styli originally borne on the tenth sternite, and are only secondarily located on the ninth sternite as the result of their migration to their final position between the dorsal valvulæ (of the ovipositor) which are located on the ninth sternite. If this be correct, the inner valvulæ of the ovipositor (and their supposed homologues, the penis valves of the male) do not originate on the same segment with the dorsal valvulæ of the ovipositor (or their supposed homologues, the gonopods or styli of the male), and therefore cannot be regarded as the endopodites of a pair of limbs whose exopodites are represented by the dorsal valvulæ (since the two branches of a biramous limb cannot originate on separate segments).

Wheeler, 1893, (l. c.) would interpret the three pairs of valvulæ composing the ovipositor of a female insect, as three pairs of modified styliform appendages

such as brief notes, book reviews, proceedings of societies, etc. Table III summarizes the major papers and gives the percentages of titles devoted to each subject. This table shows that the percentages of titles devoted to classification in the different journals ranged from 41.4 to 83.9. In nearly all of the journals more than 50 per cent. of the papers were on this subject. The percentages of titles on distribution, etc., varied from 3.2 to 17, those on anatomy etc., from 4 to 22 per cent., and those on life-history, etc., from 8 to 20.7 per cent. The remaining percentages in this table are low, except for the economic and general subjects.

TABLE III. PERCENTAGES OF MAJOR PAPERS DEVOTED TO EACH SUBJECT.

Subjects	Canadian Entomologist.	Psyche.	Jour. N. Y. Ent. Soc.	Entomological News.	Annals. Ent. Soc. Amer.	Bull. Brook. Ent. Soc.	Proc. Ent. Soc. Wash.	Jour. Econ. Ent.
General economic, methods, insecticides, etc.								36
Economic entomology							3.2	49
General subject	15			14.5		4	3.2	
Classification, etc.	59	41.4	71	58	43.3	64	83.9	
Distribution, etc.	11	17	8	10	8.7	12	3.2	
Anatomy, morphology, etc.	4	10.4	8		22	4	6.5	
Life history, habits, etc.	11	20.7	13	14.5	26	8		14
Behaviour		7						1
Origin				3		8		
Ecology		3.5						
	100	100	100	100	100	100	100	100

Fifteen groups or orders of insects were treated in the major papers of all journals as shown in Table IV, with the Coleoptera leading and followed by the Diptera, Lepidoptera, Homoptera, Hymenoptera, Hemiptera and Odonata. The main orders of insects were covered in each journal. No one group was represented to the exclusion of others, however several journals showed a considerable leaning toward some particular order, probably due to the fact that most of the contributing authors to those journals were interested in such a group.

Table V is of interest in showing the locations of authors of major papers. The District of Columbia leads with a total of 63 papers in all of the magazines listed. This is due undoubtedly to the large number of federal entomologists located there. Massachusetts, New York, Illinois, New Jersey, California, Pennsylvania, Canada and Ohio follow the District of Columbia in the order named, in so far as the number of titles is concerned. Several of the journals receive papers from many states, while a few appear to be devoted mainly to contributions from one or two states, at least such was the case during 1919.

It is no secret that most of our entomological publications or journals have seriously felt the increased cost of living during the past several years and have had difficulty in making both ends meet This has been made public i

TABLE IV. NUMBER MAJOR TITLES ON VARIOUS GROUPS OF INSECTS.

	Canadian Entomologist.	Psyche.	Journal N. Y. Ent. Soc.	Entomological News.	Annals Ent. Soc. Amer.	Bull. Brook. Ent. Soc.	Proc. Ent. Soc. Wash.	Jour. Econ. Ent.	Totals.
Diptera	15	6	2	13	5	4	5	5	55
Siphonaptera						1			1
Hymenoptera	10	11	1	3	3	2	6	4	40
Lepidoptera	4	3	2	18	5	1	3	9	45
Coleoptera	9	4	11	5	5	5	8	12	59
Orthoptera	2	3	1	1	1	1		2	11
Hemiptera	6		1	2	1	7		1	18
Homoptera	10		4	9	2		6	12	43
Parasitica							1		1
Thysanoptera	1								1
Odonata	2	1		6					9
Trichoptera			1						1
Ephemerida	1								1
Mallophaga								1	1
Isoptera							1		1
Various groups including Acarina	12	1	1	5	1	4	1	27	52
Totals	72	29	24	62	23	25	31	73	

TABLE V. ORIGIN OF MAJOR PAPERS.

	Canad. Ent.	Psyche	Jour. N. Y. Ent. Soc.	Ent. News	Annals Ent. Soc. Amer.	Bul. Brook. Ent. Soc.	Proc. Ent. Soc. Wash.	Jour. Econ. Ent.	Total
Canada	11	1		1	1				14
Idaho								1	1
Va								2	2
Md.								1	1
N. H.								1	1
Ariz								1	1
Ill	13		1	5	2	4	1	1	27
Col	4			3				1	8
Iowa	2							3	5
D. C.	6		1	8	2	5	25	16	63
N. C.	2			1					3
Wis	2			1	1			1	5
Mont	1			1		1			3
Ky	1			1				1	3
N. Y	4	4	12	3	2	6		5	36
Mass	7	19	3	6	4	4	3	1	47
Ore	2			1				1	4
Ind	3			2				4	9
Cal	4			5	2			11	22
Ohio	2	1		4	4			3	14
N. D.	1								1
Mo	1			2					3
N. J.	4	4	2	5	1	3		4	23
T. H.	2		1						3
Neb.			2	1					3
Conn				1				1	2
Kan				1				4	5
Pa				8	3			4	15
Tex				2				1	3
Mich					1				1
Fla						1	1		2
Minn						1		2	3
Italy			1						1
England			1						1
Japan							1		1
N. Queensland								3	3

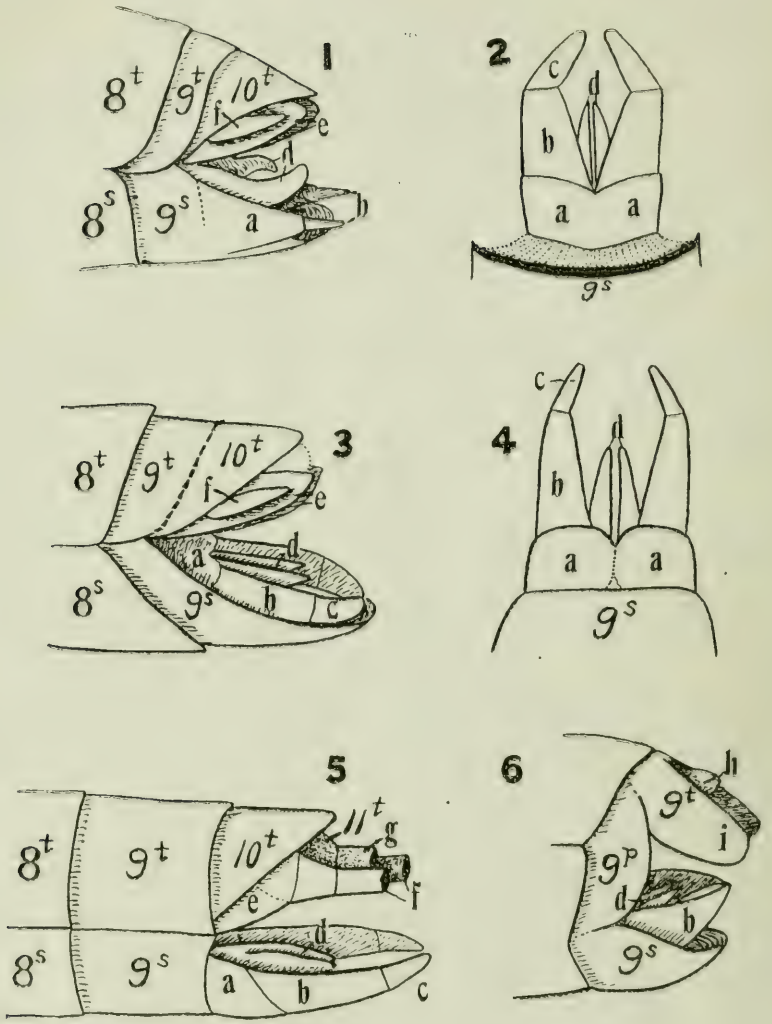
originally borne on the eighth, ninth and tenth sternites respectively, and homologizes them with paired styli borne on the eighth, ninth and tenth sternites of the male. While all three pairs of styli persist in the female (the pair originally borne on the tenth sternite migrating to a position on the ninth, in the female), only the pair borne on the ninth sternite persist in the male, the other pairs gradually disappearing as development proceeds. It must be admitted that Wheeler's choice of *Xiphidium* was an extremely unfortunate one, since the genitalia of the males of these insects are too highly modified to give the best results for such an investigation; and until the ontogenetic development of more favorable forms, such as the Ephemerida, sawflies, etc., have been studied with a view to determining the interpretation of the parts in male insects, we must conclude that the evidence available is not entirely satisfactory, especially since Heymons, Palmen, and others who have also traced the development of the parts in males of lower insects, do not agree with Wheeler in many particulars.

A study of the so-called gonopods, or arthrostyles,* borne on the ninth abdominal segment in trichopterous larvæ, has convinced me that these structures form the claspers or gonopods of adult male caddice-flies (i. e., the structures labeled "c" and "b" in Fig. 2), and since these structures are evidently appendages of the ninth abdominal segment (not of the tenth abdominal segment, as was stated in the article published in Psyche) in caddice-fly larvæ, I would interpret the outer claspers of the genitalia of the males of higher insects as appendages (styli) of the ninth abdominal segment. On the other hand, the penis valves may or may not belong to the same segment, although I am inclined to interpret them as appendages (endopodites ?) of the ninth abdominal segment also.

If the structures labeled "a" and "b" in Fig. 1 are homologous with those labeled "a" and "b" (with "c") in Fig. 5, and if these in turn are homologous with the structures labeled "a" and "b" (with "c") in Fig. 3, it is quite evident that there has been a considerable shifting of the parts in the different insects under consideration. Thus, in the roach shown in Fig. 1, the styligers or "coxites" labeled "a," instead of tending to remain more or less distinct as in the Ephemerida ("a" of Figs. 4 and 5), become more closely united with the ninth sternite "9^s" of Fig. 1, while the penis valves "d" are apparently attached behind the posterior border of the ninth sternite—which has either grown out posteriorly beneath them, or the penis valves have been shifted forward basally. If the structures bearing the label "d" in Fig. 1 are the homologues of the penis valves of the other insects figured, they have followed a line of specialization leading toward the asymmetrical development of the parts, and their relation to the styli or gonopods "a" and "b" is somewhat different from that occurring in the higher insects.

Another course of development has apparently been followed in the sawfly shown in Fig. 3, since the ninth sternite "9^s" (which does not project far posteriorly in the ephemerid shown in Fig. 5, "9^s") has grown outward and back-

*In the larvæ of certain sawflies such as *Neurotoma*, there occur near the base of the sternite of the tenth abdominal segment, a pair of jointed appendages which I interpreted as segmented styli (arthrostyles) from the fact that they are borne on the sternum of the segment. Mr. Middleton, however, informs me that these apparent arthrostyles are transformed into the cerci of the adult male insect, and if this be correct, the structures in question should be designated as cerci rather than as styli (or arthrostyles) in these larvæ.



TERMINAL ABDOMINAL STRUCTURES OF MALE INSECTS.

(P. 183)

ward under the structures labeled "a," "b," "c," and "d" in Fig. 5, thus bringing them into the position of the structures labeled "a," "b," "c," and "d" in Fig. 3. If the plate bearing the labels "a" and "a" in Fig. 2 of a sawfly, represents the plate labeled "a" and "a" in Fig. 4 of an ephemerid, it is quite evident that the styligers or "coxites" whose fusion product is represented by the plate bearing the labels "a" and "a" in Fig. 2, are distinctly separated from the ninth sternite "9^s" which originally bore them (?) thus presenting a condition comparable to

that occurring in the male of *Grylloblatta campodeiformis*, which Walker, 1919 (l. c.) considered to be unique among winged insects.

The relative positions of the parts in the sawfly (Figs. 3 and 2) are essentially the same as in the more primitive representatives of the higher orders of insects, such as the tipulids among the Diptera, *Philopotamus* among the Trichoptera etc., but other structure become secondarily developed in certain of these forms, thereby rendering the arrangement of the parts much more complicated and difficult of interpretation. As was described in a paper on the genitalia of male sawflies (Proc. Ent. Soc. Washington, 1919, Vol. 21, p. 129) there become differentiated from the distal portion of the segment "b" (Fig. 2) of the sawfly's gonopods, a pair of inner claspers which were interpreted as the volsellæ of higher Hymenoptera in the paper referred to above. These volsellæ-like structures probably correspond to the inner claspers of such Lepidoptera as the Geometridæ, etc. One or both of the valves of the penis "d" may form a portion of the aedeagus; and numerous other changes take place through the outgrowth of various "prongs" and other structures, through the modification of the tergites, such as the posterior prolongations of the lateral region of the ninth tergite labeled "i" in Fig. 6, etc., but these features have been more fully described in an article which will soon appear in Psyche, and need not be further discussed here.

Abbreviations.

a. Styligers or "coxites"; basal structures bearing the styli. They may unite to form a single plate or basal ring.
b. Basal segments of the styli or gonopods.
c. Distal segments of the styli or gonopods.
d. Penisvalvæ or valves of the "penis."
e. Paraprocts, or plates on either side of the anus.
f. Cerci.
g. Telofilum, or terminal filament.
h. Proctiger, or anal papilla bearing anus.
i. Surgonopods, or accessory claspers; prolongations of the ninth tergite.

The ninth sternite "9^{s}" forms the hypandrium, the ninth pleurite "9^{p}" forms the gonopleurite, and the tenth or eleventh tergite forms the epiproct. The letters t, p and s written to the right and above the numerals are used to indicate the tergite, pleurite and sternite of their respective segments.

Explanation of Plate VI.

Fig. 1. Lateral view of terminal structures of a blattid (based on *Cryptocercus*).
Fig. 2. Ventral view of genital forceps of a sawfly (based on *Sirex*).
Fig. 3. Lateral view of terminal structures of a sawfly.
Fig. 4. Ventral view of genital forceps of a mayfly (based on *Blasturus*).
Fig. 5. Lateral view of terminal structures of a mayfly.
Fig. 9. Lateral view of terminal structures of a Neuropteron (based on *Nymphes* and *Ithone*).

All figures are very diagrammatic.

ON CHILOPODS OF THE FAMILY MECISTOCEPHALIDÆ.

BY RALPH V. CHAMBERLIN,
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While some confusion still exists in the application of the generic name Mecistocephalus Newport and consequently of the family name Mecistocephalidæ, under the rules of the International Code the problem is a simple one, and *punctifrons* Newport is clearly the type of the genus. Lamnonyx thus falls as a synonym to Mecistocephalus. In the present paper Mecistocephalus is regarded as thus unalterably fixed, and the family Mecistocephalidæ is treated broadly as including all mecistocephaloid forms

KEY TO GENERA OF THE MECISTOPHALIDÆ.

a. Coxosterna of second maxillæ discrete, not fused at middle line; palpi of second maxillæ clawless.....(Arrupinæ).
  b. Coxæ of first maxillæ discrete.....Arrup Chamberlin.
  bb. Coxæ of first maxillæ fused.....Prolamnonyx Silvestri.
aa. Coxosterna of second maxillæ united at middle line; palpi of second maxillæ with claws.....(Mecistocephalinæ).
  b. Cephalic plate with a stout spine beneath near each anterolateral corner; clypeal region divided by a distinctly areolate median longitudinal band extending from anterior areolate area; clypeal setæ few.
    c. Coxopleuræ of last pediferous segment very large, extending to or beyond the spiracle of the preceding segment.....Megethmus Cook.
    cc. Coxopleuræ of last pediferous segment of normal size, not embracing the preceding segment.
      d. Laminæ of mandibles, excepting the first, with teeth confined to distal region proximad of where they are replaced by a close line of cilia.
      Lateral pieces of labrum with margin ciliate throughout.....Dasyptyx Chamberlin.
      dd. Laminæ of mandibles with teeth throughout, no such ciliate lines.
        e. Labral margins shortly ciliate throughout; teeth of mandibular laminæ, except distally, exceedingly minute.....Brachyptyx, gen. nov.*
        ee. Labral margins either wholly smooth or setose or ciliate only for a very short distance subjacent to median angles; proximal teeth of mandibular laminæ not at all or only moderately and gradually reduced.
          f. Labral margins wholly smooth; teeth of first lamina of mandibles seven or less.....Mecistocephalus Newport.
          ff. Labral free margins with a few setæ or a short line of cilia at mesal ends subjacent to median piece; teeth of first mandibular lamina ten or more, the mesal edge of mandible serrate.....Pauroptyx, gen. nov.

*Genotype, *Mecistocephalus mirandus* Pocock (*Lamnonyx mirandus* Silvestri).

bb. Cephalic plate with no such teeth beneath; clypeal region not divided by a median areolate band, its setæ usually very numerous.

c. Free margins of lateral pieces of labrum ciliate throughout; preclypeal setæ very numerous; channel from salivary pore in coxosternum extending caudad to or near the posterior angles.....Dicellophilus Cook.

cc. Labral margins wholly smooth; preclypeal and clypeal setæ very few; channel from salivary pore in coxosternum on each side extending laterad to margin well cephalad of posterior angles as in Mecistocephalus, etc.....Tygarrup Chamberlin.

Below is given a list of the known species of Mecistocephalidæ, with localities for each. In this list the numerals in parentheses with page numbers following each name refer to the literature at the end of the present paper in which the original descriptions were published.

A List of The Mecistocephalidæ.

Mecistocephalus Newport.

M. angusticeps (Ribaut), (24), p. 23. Africa.
M. angustior Chamberlin, (9). Society Is.
M. castaneiceps Haase, (12), p. 102. Pulo Edam Is.
M. cephalotes Meinert, (18), p. 100. Java; India, etc.
M. cephalotes multispinata (Silvestri), (27), p. 61. India.
M. cephalotes subinsularis (Silvestri), (27), p. 61. Ceylon; Sumatra; Mergui; Tonkin.
M. curvidens Haase, (12), p. 104. Philippines (Bohol).
M. cyclops Brölemann, (4), p. 528. Seychelles.
M. diversidens (Silvestri), (27), p. 76. India.
M. diversisternus (Silvestri), (27), p. 81. Japan.
M. erythroceps Chamberlin (9). Fiji Is.
M. guildingii Newport, (21), p. 179. =**M. maxillaris** (Gervais).
M. gulliveri Butler, (3), p. 446. =**M. maxillaris** (Gervais).
M. hamidens Haase, (12), p. 1, 6, legend and fig. =**M. curvidens** Haase.
M. heros Meinert, (19), p. 214. =**M. insularis** (Lucas).
M. hetercpus Humbert, (13), p. 19. Ceylon.
M. insularis (Lucas), (17), Annex N. Africa; India; Seychelles, etc.
M. insularis orientalis (Silvestri), (26), p. 59. India; Sumatra; Andamans
M. japonicus Meinert, (20), p. 142. Japan.
M. kurandanus Chamberlin, (9). Australia.
M. leonensis (Cook), (10), p. 79. =**M. maxillaris** (Gervais).
M. lifuensis Pocock, (24), p. 63. Loyalty Is.
M. maxillaris (Gervais), (11), p. 52. Tropicopolitan.
M. meinerti Seliwanoff, (26). Central Asia (Taschkent).
M. mimeticus Chambelrin, (9). Solomon Is.
M. modestus (Silvestri), (27), p. 68. New Guinea.
M. nannocornis, sp. nov. Phillipines.
M. nigriceps Chamberlin, (9). Fiji Is.; Solomon Is.

M. parvus Chamberlin,[1] (8), p. 85. Galapagos Is.

M. punctifrons Newport, (21), p. 179. India.

M. punctifrons glabridorsalis Attems, (1), p. 138. =**M. insularis** (Lucas).

M. rubriceps Wood, (30), p. 42. Japan; Bonin Is.; Philippines; Formosa.

M. simplex Chamberlin, (9). Australia.

M. smithi Pocock, (23), p. 351. China; Formosa.

M. spissus Wood, (30), p. 43. Hawaiian Is.

M. sulcicollis Tömösvary, (28), p. 162. Borneo.

M. tahitiensis Wood, (30), p. 43. Society Is.; Australia; New Guinea; Fiji Is.

M. tenuiculus (L. Koch), (16), p. 794. =**M. rubriceos** Wood.

M. togensis (Cook), (10), p. 39. =**M. insularis** (Lucas).

Megethmus Cook.

M. ferrugineus (Hutton), (14), p. 115. New Zealand.

M. huttoni (Pocock), (22), p. 223. =**M. ferrugineus** (Hutton).

M. microporus (Haase), (12), p. 106. Philippines (Luzon).

M. pluripes, sp. nov. Philippines.

Pauroptyx, gen. nov.

P. himalayanus, sp. nov. India.

P. pallidus (Silvestri), (27), p. 65. India.

P. superior (Silvestri), (27), p. 63. India.

Brachyptyx, gen. nov.

B. mirandus (Pocock), (23), p. 352. Japan; Formosa; etc.

Dasyptyx, gen. nov.

D. gigas (Haase), (12), p. 105. New Guinea.

D. solomonensis Chamberlin, (9). Solomon Is.

D. subgigas (Silvestri), (27), p. 70. New Guinea.

D. uncifer (Silvestri), (27), p. 72. New Guinea.

Dicellophilus Cook.

D. anomalus (Chamberlin), (5), p. 665. Western United States.

D. apfelbecki (Verhoeff), (29), p. 348. =**D. carniolensis** (C. Koch).

D. apfelbecki diversiporus (Verhoeff), (27), p. 348. =**D. carniolensis** (C. Koch).

D. breviceps (Meinert), (19), p. 214. =**D. limatus** (Wood).[2]

D. carniolensis (C. Koch), (15), p. 185. Europe.

D. limatus (Wood), (30), p. 42. Western United States.

Tygarrup Chamberlin.

T. intermedius Chamberlin, (7), p. 212. British Guiana.[3]

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1 Dr. Silvestri thinks this the same as *M. maxillaris;* but in this he is in error. As a matter of fact the two species are widely separated. Aside from differences in mouthparts, *parvus* may at once be distinguished from *maxillaris* in having the sternal impressions simple, not at all anteriorly furcate. It is a much smaller species with fuscous head and prehensors.

2 The type of *M. breviceps* Meinert is in the Mus. Comp. Zool. at Cambridge. In the old insect catalogue (No. 310), it is noted as collected on Nantucket in Aug., 1853. This record, however, is probably erroneous. Both the type and the paratype, which is without locality label, agree fully with specimens of *D. limatus* (Wood) from California.

3 Taken at Washington, D. C., in pots of plants at quarantine from British Guiana.

Prolamnonyx Silvestri.

P. holstii (Pocock), (23), p. 352. Japan; China.

P. indecorus (Attems), (2), p. 287. =**P. holstii** (Pocock)

P. santeri Silvestri, (27), p. 87. Formosa.

Arrup Chamberlin.

A. pylorus Chamberlin, (6), p. 654. California.

Description of New Forms.

Mecistocephalus nannocornis, sp. nov.

Dusky brown, the head darker, more blackish.

Head coarsely deeply punctate; exceptionally short in proportion to width, being only 1.4 times longer than wide; frontal suture very distinct as in most species, the suture bowed forward at its middle. Tooth on ventral side of anterior corner much reduced. Antennæ very short, scarcely reaching to end of first tergite.

Tergites uneven, roughened; sulci in middle and posterior regions very strongly impressed.

Prosternum proportionately short and wide, rather finely punctate; anterior margin with two low, rounded teeth. Prehensors with femuroid bearing a single tooth at distal end; second and third joints also armed; claw with tooth low and slight, almost obsolete. Sternites with a deep median longitudinal sulcus not bifurcate at its anterior end.

Last ventral plate strongly narrowed caudad, the caudal margin straight. Coxopleuræ with pores of moderate size, not crowded, about thirty on each side.

Last dorsal plate broad and shield-shaped.

Pairs of legs only forty-five.

Locality.—P. I.; Mt. Makiling. (C. F. Baker).

Type.—M. C. Z., No. 2006.

Like *spissus* Wood, occurring in the Hawaiian Is., in the number of pairs of legs; but readily distinguished by its proportionately much shorter head, etc.

Megethmus pluripes, sp. nov.

This species may be distinguished from *microporus* in the smaller coxopleuræ of the last segment which enroach upon the penult segment only as far as the spiracle, not reaching the anterior end; pores similarly very numerous and fine. Pairs of legs ninety-seven instead of one hundred and one.

General colour fulvous; head and prehensors red or light chestnut.

Head very long and narrow, being just twice as long as the greatest width. Paired sulci close together, parallel, distinct for a short distance in front of caudal margin, then becoming vague. Antennæ long; joints all long. Mandible with nine dentate plates of which the first has but three teeth and a median one near twenty of which the more proximal are more widely spaced. Median piece of labrum cuneate; lateral pieces with margin wholly smooth, mesal tooth but vaguely indicated.

Basal plate with a sharply impressed median longitudinal sulcus. Prosternum sparsely punctate; unarmed anteriorly. Femuroid of prehensors each with two stout black teeth on mesal side of which the distal one is much the larger; teeth of second and third joints black, rounded; tooth of claw very low, indistinct.

Sternites each with a deep, Y-shaped impression, the branches widely diverging, at or caudad of the middle, the angle very obtuse, the ends transverse.

Dorsal plates bisulcate from the first caudad.

Length, 75 mm.

Type—M. C. Z. 1,917; paratypes M. C. Z. 1,918. Philippines: Mr. Banahao, C. F. Baker.

Pauroptyx, gen. nov.

In this genus there is a short series of setæ or cilia on or projecting from beneath the free edge of each lateral piece of the labrum at its mesal end. The mesocaudal angle of each lateral piece of the labrum is typically more strongly produced than in Mecistocephalus. The first lamina of the mandible has from ten to sixteen teeth in the known species, the series of teeth being continued proximally by a series of characteristic serrations along the mesal edge of the mandible.

Genotype.—*P. himalayanus*, sp. nov.

The known species are all from India.

Pauroptyx himalayanus, sp. nov.

The median piece of the labrum in this species projects caudad beyond the edge of the main part of each lateral piece; each lateral piece adjacent to the median piece produced caudad into a long acute tooth somewhat like but proportionately much longer than the corresponding processes of *P. superior* and *P. pallidus*. Labrum with setæ showing at mesal end at a near angle formed by mesal process and main part of plate, these in part, at least, merely stiff hairs projecting from beneath (i. e., from dorsal surface) the edge and similar to the other hairs clothing the dorsal surface. Mandibles with nine pectinate lamellæ of which the first is ten-toothed; the inner margin below these teeth conspicuously serrate. A median lamella has about thirty-eight teeth which decrease from the distal end proximad in the usual way. Head 1.9 times, or slightly less, longer than wide. Anal legs more than twice as long as the penult. Last sternite large, more strongly narrowed caudad than in *pallidus* but similarly constricted in front of caudal end; broader in male, the caudal lobe more abruptly set off.

Colour uniform fulvous to light brown, the legs concolorous. Head and prehensorial segment abruptly darker, chestnut to mahogany. Antennæ fulvous.

Length to 60 mm.; width of first plate, 1.8 mm.

Pairs of legs, forty-nine.

Type.—M. C. Z. 899; paratypes, 897, 900, 898. India; Himalayas; Koolloo; near Amballa.

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BOOK NOTICES.

THE CRANE-FLIES OF NEW YORK. Part I. Distribution and Taxonomy of the Adult Flies. By Charles Paul Alexander. Memoir 25. Cornell University Agricultural Experiment Station. Ithaca, N. Y., 1919. Pp. 769-993; with 6 plates and 11 text figures.

It has been heretofore practically impossible for anyone in Eastern North America, except the specialist, to determine for himself specimens of crane-flies taken within that area. The present work has removed this obstacle and, therefore, fills an important gap in entomological literature. It will be widely welcomed by all who ever have occasion to deal with the taxonomy of these flies.

Mr. Alexander's work on this somewhat neglected group is so well known that it is scarcely necessary to comment on the thoroughness with which both the text and the illustrations have been prepared. The work is based on the study of a large number of collections, both public and private, and its geographical scope is much greater than is indicated in the title, all the species from Eastern North America being included.

Besides the portions concerned with classification and distribution, there are useful sections dealing with the immature stages, the haunts and habits of both larvae and adults. The larval habits are very varied, some species being aquatic, some inhabiting mud, others fungi, wood and bark, while a few feed upon leaves like caterpillars. Methods are described for rearing these various types of larvæ.

The external anatomy of the adult flies is treated from the taxonomic point of view, structures affording good taxonomic characters, such as the antennae and wing venation, receiving a relatively large space. In connection with the description of abdominal structures it may be mentioned here, although not in criticism of Mr. Alexander's work, that the term "pleurite" as applied to the structures attached to the caudal margin of the ninth abdominal sternite, is morphologically incorrect, these parts being undoubtedly *coxites*, and having nothing to do with the pleural region of the segment.

The analytical keys appear to be excellent in every respect, so far as can be judged by one who is not a specialist in this group. The details of distribution for each species in New York State are not given in the decriptive part, but in the special section on distribution. An important feature of this section is the discussion of the distribution of the Tipulidae and related familes by life-zones. Following the definitions of the various zones, lists of characteristic plants and crane-flies are given. Between the Canadian and Transition Zones another zone, or sub-zone, the Canadian-Transition, is recognized, a distinction which undoubtedly has its advantages, although it is largely a matter of convenience as to how many zones should be recognized within the territory discussed, where in reality the changes depending on latitude, except where modified by local conditions, are entirely gradual. Some of the plants listed for the Transition Zone are, in the reviewer's opinion, typical of the Upper Austral, such as *Chamaecyparis thycides*, *Juglans nigra* and *Sassafras variifolium*.

"The number of species of Crane-flies that should occur in New York State is probably not less than three hundred and this figure seems similarly appli-

cable to many areas of equal extent and equal diversity of ecological conditions in the North Temperate Zone."

It is almost superfluous to add that this excellent work should be in every entomological library, and that no teacher of systematic entomology can afford to be without it. E. M. W.

ORTHOPTERA OF NORTHEASTERN NORTH AMERICA with Special Reference to the Faunas of Indiana and Florida. By W. S. Blatchley. The Nature Publishing Co. Indianapolis, 1920. 784 pp. 5 plates and 246 text figures.

The aim of this manual is to furnish a ready means of identifying any species of Orthoptera found in the United States east of the Missippi River and Canada east of the 90th meridian. It is intended for the use of the beginner rather than the specialist, but the subject matter is treated in such detail that it is thoroughly well adapted to the needs of the most advanced student as well.

It is an outgrowth of the author's well-known treatise on the Orthoptera of Indiana, but not only deals with a large number of species not included in the Indiana fauna, but the data on the latter forms is revised and considerably expanded. It also differs in plan from the older work in that it contains an alphabetical list of synonyms at the end of the book, instead of listing these under the head of each species; although the principal synonyms are mentioned in the notes that follow the descriptions.

One of the many excellent features of the book is the full discussion of the haunts, habits and songs of the various species, in which Mr. Blatchley has quoted at considerable length from other authors, selecting those passages which are considered to be of most value to the subject.

The illustrations are for the most part selected either from the author's earlier work or from the works of other specialists, but include also two plates of excellent original figures, by Mr. Fox, of the genitalia of the various species of the genus *Ceuthophilus*. Unfortunately a few of the text figures were inverted by the printer, but the pages on which these occur have already been reprinted with the figures in their correct positions. One of these figures is that of *Arphia sulphurea*, and it was unfortunate that this figure was selected to illustrate this species since, in the reviewer's opinion, it must have been taken from some other species, the tegmina being quite unlike those of an Arphia in their transverse fasciae, which with the shape and pattern of the hind wings, are typical of *Circotettix verruculatus*.

It is the reviewer's unpleasant duty to point out also certain other errors and inaccuracies in this otherwise excellent manual, which have come to his notice.

The Articulata (p. 12) are divided into two great groups, the Vermes and the Arthropods. The term Vermes is here used, of course, for the segmented worms (Annelida) only. It is now obsolete as the name of a taxonomic group, but when in use was understood to include a number of other groups besides the Annelida.

In the description of the mouth-parts on p. 14 it is stated that the labial palpi are attached to the labrum, and no mention is made of the labium.

On page 21 the term *tergite* is used to designate one side of a tergum, whereas it is generally employed to denote the entire dorsal sclerite.

On p. 22 the supra-anal plate (of the locust) is said to be the tergum of the tenth abdominal segment. It is really the eleventh, as is correctly indicated in the figure on the same page.

The family name used for the grouse locusts is Tetrigidæ, since the author objects to the confusion which is likely to arise from the use of both names Acrydiidæ and Acrididæ (the latter being the family to which the ordinary locusts belong). If, as stated on p. 187, the name Acrididæ were derived from the Latin *Acridium*, its proper spelling would be Acridiidæ, and it would indeed be objectionable to use both this term and Acrydiidæ, since *Acridium* is merely an amended spelling of Acrydium. But the name Acrididæ is not derived from Acridium but from Acrida (an Old World genus) and if *Acrydium* is employed for the typical genus of grouse locusts, instead of *Tetrix*, the family name Acrydiidæ and the subfamily name Acrydiinæ must likewise be used, to conform with the established rules of nomenclature.

In the section on p. 745, entitled "Area and Life Zones Covered," the Hudsonian Life Zone as defined as equivalent to the entire Boreal Region of Merriam, and the Boreal Fauna is stated to be the fauna of this zone. According to Merriam the Hudsonian is the middle zone of the three into which the Boreal Region is divided, the others being the Arctic and Canadian; and although, as far as Orthoptera are concerned, there would be little need of these divisions, they are, on the whole, quite as distinct as the zones of the Austral Region.

Mr. Blatchley's definitions of the areas included in the other zones also differ from those generally accepted, but as the limits of the zones are not easily definable, such matters depend to a large extent upon personal preference and judgment. It is unfortunate, however, to select as typical of the Alleghanian fauna *Chorthippus curtipennis*, and *Melanoplus fasciatus*, since these species are distributed throughout the Canadian Zone well into the Hudsonian, if not to the Arctic. Two of the three representatives of the Carolinian Fauna, *Chlocaltis conspersa* and *Melanoplus femur-rubrum*, are also in no respect characteristic of this fauna, both ranging through the Transition well into the Canadian Zone.

On the whole Mr. Blatchley has shown very good judgment, in our opinion, in his decisions as to the status of various forms described as species. *Tettix crassus* Morse is, e. g., very properly assigned to the synonymy of *Acrydium ornatum* Say, and *A. hancocki* (Morse) is placed as a variety of this species; while *Oecanthus quadripunctatus* Beutenm. is correctly placed as a variety of *O. nigricornis* F. Walk. He has not, however, accepted the present writer's decision in reducing *Podisma variegata* Scudd. to a race of *P. glacialis* Scudd., although this has been amply proven. In fact *variegata* grades by infinitesimal steps into *canadensis*, and if there is a line to be drawn anywhere it is between *canadensis* and *glacialis*.

It must not be thought that the points criticised affect seriously the usefulness of Mr. Blatchley's book, which we feel sure will prove a most valuable work of reference for all students of this interesting order for many years to come.

E. M. W.

In accordance with the regulations of the Post Office Department respecting the postage rates on monthly magazines, it has been necessary to issue the August and September number separately.

Mailed August 23rd, 1919

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NEW SPIDERS FROM UTAH.

BY RALPH V. CHAMBERLIN,
Cambridge, Mass.

DRASSIDÆ.

Zelotes fratris, sp. nov.

Male.—A species suggesting *Z. ater* in general appearance and structure. Cephalothorax, abdomen and legs black, the tarsi of the latter paler. Posterior row of eyes straight, the eyes nearly equal and equidistant, thus clearly contrasting with *ater*, in which the median eyes are larger and much more approximate to each other than to the laterals. Anterior row of eyes procurved as usual; the medians much smaller than the laterals, being about half the diameter of the latter, more than their diameter from each other, but very close to the laterals. Area of median eyes as wide in front as, or scarcely wider than, behind. Anterior tibiæ wholly unspined, not armed at distal end as in *ater*. Anterior metatarsi with a pair of spines at base. Palpus with apophysis suggesting that of *ater*, the bulb, however, differing decidedly in details and much more similar to that of *tuobus*. See fig. 18, 1 and 2.

Length 6.3 mm. Length of cephalothorax 2.8 mm. Length of tib.+pat. I, 2.6 mm.; of tib.+pat. IV 2.8 mm.

Locality.—Utah: Logan Canyon. Collected by my brother, Seth C. Chamberlin.

Aside from difference in the palpal organs which are represented in the figures, this form differs fom the male paratype of *tuobus* in having the tib.+pat. IV of the same length as the cephalothorax instead of much longer. In the male paratype of *tuobus* the cephalothorax is 3 mm. long, while the tib.+pat. IV measured 3.7 mm.

Zelotes lampra, sp. nov.

Female.—Cephalothorax shining black. Legs black, with all tarsi and the metatarsi of the first three pairs in the type paler. Abdomen black both above and below. Anterior row of eyes procurved in such degree that the tangent to the lower edge of the medians passes through or very near the centres of the laterals. Median eyes much smaller than the laterals, about their diameter apart, much closer to the laterals. Posterior row of eyes straight; median eyes larger than the laterals, scarcely their radius apart, an equal distance from the laterals. Quadrangle of median eyes wider behind than in front, a little longer than wide. Tibia I+II armed beneath near middle (or possibly a pair of spines). Metatarsi I and II each with a pair of subbasal spines beneath. Distinguished readily by the form of the epigynum, which is represented in fig. 19, 3.

Length 5 mm. Length of cephalothorax 2 mm. Length of tib.+pat. I 2 mm.; of tib.+pat. IV 2.36 mm.

Locality.—Utah: Salt Lake Co., Mill Creek.

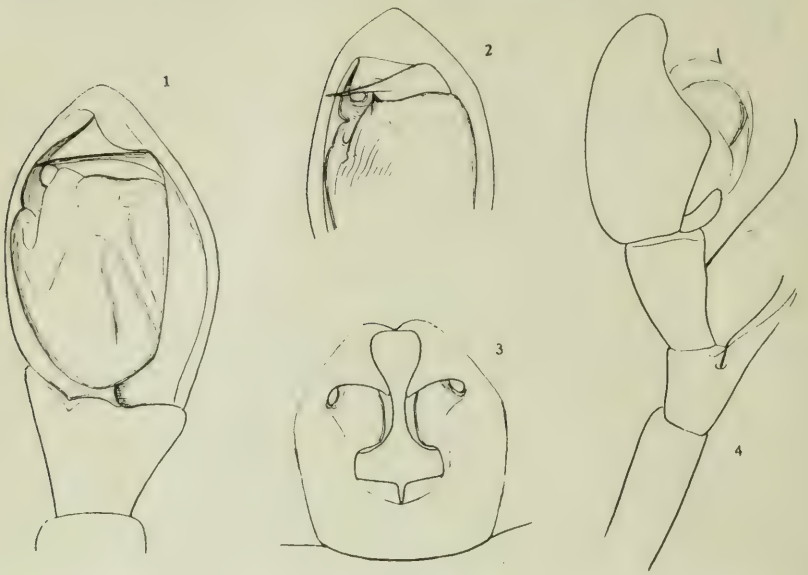

Fig. 19. 1. *Zelotes fratris*, sp. n.; ventral view of male palpus. x44. 2. *Zelotes tuobus* Chamberlin, distal part of tarsus of male palpus, ventral view. x44. 3. *Zelotes lampra*, sp. n., epigynum. x73. 4. *Linyphia hespera*, sp. n., male palpus, dorsal view. x44.

LINYPHIIDÆ.

Linyphia hespera, sp. nov.

Coloration essentially identical with that of *L. phrygiana*, with which it has heretofore been confused. Cephalothorax light yellow, narrowly margined with black and with a black median longitudinal line along dorsum which widens clavately up the head to the eyes, this clavate portion geminate by a median pale line and each half again divided at anterior end by a broad process of yellow. Abdomen marked by the typical dark herringbone longitudinal dorsal stripe, this often in part obliterated anteriorly. Legs yellow, typically annulate as in *phrygiana*, with femora commonly minutely maculate. The markings of body often reddish instead of black. The species is most readily distinguished by the characters of the male palpus. The patellar apophysis is similar in position and general form to that of *phrygiana* but differs uniformly in narrowing continuously distad to the tip, where it is acute instead of being clavate and rounded at the end as it is in *phrygiana*. The conspicuous principal seta of the tibia as viewed from above is inserted towards the distal end instead of near the middle; and at the base of the patella apophysis above is a seta, typically as long as to longer than the apophysis, which is geniculate above its base. See Fig. 19, 4. The epigynum is very similar to that of *phrygiana*. The median lobe seems to have the distal portion a little broader and the narrow isthmus a little shorter.

Length of male type 5 mm. Length of cephalothorax 2.37 mm.; width 2.1. mm. Length of tib.+pat. I 4.1 mm.; of tib.+pat. IV 2.7 mm.

Locality.—Utah: Bear Lake, Logan Canyon. Numerous specimens Females from Chalk Creek, Uintah Mts., seem also to be of this species.

Lepthyphantes lamprus, sp. nov.

Female.—Carapace fulvous, the eyes edged with black and a marginal stripe on each side also black. Sternum dusky, almost black. Legs fulvous, strongly annulate with black, the femur with an annulus at each end and one at middle, the patella with one at distal end, the tibia and tarsus each with one just proximad of middle and one at distal end, and the tarsus darkened at middle. Abdomen in general black, a network of yellowish or whitish lines above separating off a longitudinal row of black spots on each side with a pointed longitudinal mark between them at base. Venter with a light spot in front of spinerets. Head protruding a little forward above clypeus, the upper part of which is depressed, from where the latter slants forward. Anterior row of eyes straight; the median eyes decidedly smaller than the laterals and much nearer together, being rather less than their radius apart but nearly their diameter from the laterals. Posterior row of eyes straight; median eyes larger than the laterals from which separated by scarcely their radius, nearer to each other. Area of median eyes much wider behind than in front. Epigynum as shown in Fig. 20, 1.

Length about 3 mm. Length of cephalothorax 1.3 mm. Length of tib.+pat. IV 1.63 mm., the length of tib.+pat. I the same or very nearly so.

Locality.—Utah: Logan Canyon.

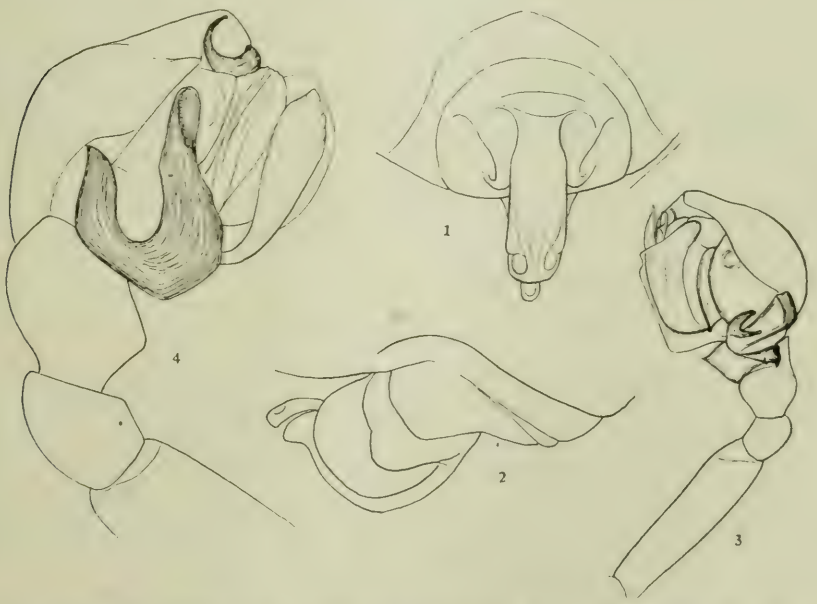

Fig. 20. 1. *Lethyphantes lamprus*, sp. n., epigynum, ventral view. x74. 2. The same, side view. x74. 3. *Bathyphantes phylax*, sp. n., left male palpus, ectal view. x44. 4. *Microneta, uta* sp. n., right male palpus, ectal view. x175.

Bathyphantes phylax, sp. nov.

Male.—Cephalothorax dusky over a yellowish ground. Legs yellowish, slightly darkened, less so distad of the patellæ. Cephalorax longer than wide in about the ratio 9:7. Head highest caudad of eyes, convex; sides rather steep and clypeus subvertical with head a little bulging forward above it. Lateral

eyes on rather pronounced tubercles suggesting those of some species of *Micronēta*. Posterior row of eyes straight; median eyes a little less than their diameter apart, and a little more than their diameter from the laterals. Anterior row of eyes straight or scarcely recurved; median eyes less than their radius apart, their diameter from the laterals. Palpal organ with a broad membranous blade curving forward from base beneath the style, its edge denticulate above across its distal end. Hook bent into a semicircle with a subquadrate plate from its ectal side below and a spur at the caudodorsal angle of the latter as shown in Fig. 20, 3.

Length of cephalothorax 1.46 mm.; width 1.14 mm. Length of tib.+pat. I 1.74 mm.; of tib.+pat. IV 1.85 mm. Metatarsus I of nearly same length as tibia I.

Locality.—Utah: Bear Lake. One male.

Micronēta uta, sp. nov.

Male.—Cephalothorax, abdomen and palpi black or nearly so. Legs fulvous, in part slightly dusky. Cephalothorax conspicuously narrowed in front of middle, obviously longer than broad (cir. 7:5). Posterior row of eyes straight; the median eyes slightly larger, scarcely their diameter apart. Anterior eyes in a straight line; the eyes nearly equidistant with the medians smaller than the laterals. Head slanting obliquely forward from posterior row of eyes to anterior row, the anterior median eyes carried forward above upper part of clypeus, the clypeus slanting forward, its profile straight. Tibia of palpus widening distad and a little elevated above but without any distinct process. Tarsal hook abruptly bent back, the distal or recurving portion long. See Fig. 20, 4.

Length 1.75 mm. Length of cephalothorax .7 mm.; width .5 mm. Length of tib.+pat. I .76 mm.; of tib.+pat. IV, .86 mm.; of met. IV. 6. mm.

Locality.—Utah: Logan Canyon.

Diplocephalus cryptodon, sp. nov.

Female.—Cephalothorax and legs yellow of a dilute orange tinge. Abdomen dark gray. Posterior row of eyes conspicuously procurved; median eyes less than their diameter and more than their radius part, the same distance from the laterals or nearly so. Anterior row of eyes straight or nearly so; medians considerably smaller than the laterals, about their radius apart and scarcely farther from the laterals. Clypeus in height equalling the length of the median ocular area or a little lower. Median ocular area longer than wide. Upper margin of furrow of chelicera armed with four teeth of which the three nearest the claw are long and subequal, the fourth tooth smaller; lower margin of furrow with four similarly well separated but similarly much smaller teeth. Epigynum as shown in Fig. 21, 3.

Male.—The postocular swelling is slight, scarcely or not at all rising above level of eyes, the hair short and sparse, forming a median longitudinal line; lateral pits conspicuous. Posterior row of eyes procurved; medians half their longer diameter apart, nearly twice as far from the laterals. Anterior row of eyes straight; the medians much smaller than the laterals, less than their radius

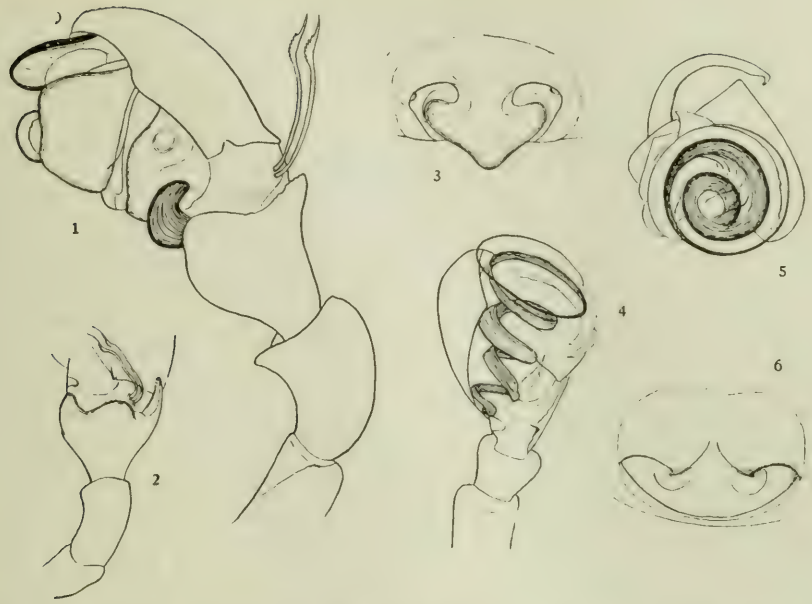

Fig. 21. 1. *Diplocephalus cryptodon*, sp. n., right male palpus, ectal view. x73. 2. Dorsal view of tibia and proximal portion of tarsus of same palpus. x44. 3. Epigynum. x73. 4. *Spirembolus vallicolens*, sp. n., male palpus, ventral view. x86. 5. Male palpus, distal view. x86. 6. Epigynum. x103.

apart, their diameter from the laterals. In the palpus the tibia at its distal end is expanded into a thin cup or calyx over the base of the tarsus as in *dentipalpis* (Emerton). On the inner surface of the dorsal part of this calyx, or hood, is borne a small tooth but this is well removed from the edge and is smaller and less chitinous than that of *dentipalpis*. In contrast with the conspicuously long and exposed embolus of *dentipalpis*, that of the present species is comparatively short though presenting a similar double curve, as shown in Fig. 21, 1 and 2.

Length of male 2.5 mm. Length of cephalothorax 1.2 mm.; width 1 mm.

Locality.—Utah.

Spirembolus, gen. nov.

Cephalothorax normally narrowed anteriorly, the front obtuse. Clypeus higher than the length of median eye area, strongly convex in dorsal views. Anterior row of eyes from straight to procurved; medians much smaller than the laterals and nearer to each other than to the latter. Posterior row of eyes from straight or slightly recurved, as in the genotype, to slightly procurved; medians farther from each other than from the laterals, or the eyes nearly equidistant (male of *vallicolens*). Area of median eyes wider than long. Anterior tarsi shorter than the metatarsi. In the male palpus the tibia bears a slender apophysis which extends over the tarsus which ends in a slender pointed tip which is bent abruptly. Cymbium of tarsus conspicuously elevated in middle above; bulb characterized by having the embolus coiled in a spiral which widens from the base of the bulb distad, the coils being nearly at right angles to the long axis of the joint, and thus quite from the disposition in *Spiropalpus*.

Genotype.—*Cornicularia monticolens* Chamberlin.

Includes also the species described below. These forms are at once distinguishable from others by the peculiar male palpi which are notably fixed in structure in comparison with other characters such as those of the cephalothorax.

Spirembolus vallicolens, sp. nov.

Male.—Carapace dusky over yellow, darker toward lateral margins. Legs and palpi somewhat paler than carapace. Labium and endites in colour like the carapace, the sternum darker. Abdomen blackish, without definite markings. Anterior portion of pars cephalica elevated but not bulging forward over base of clypeus as it does in *monticolens*, the lower part of clypeus slanting farther forward, the head in dorsal view not so convex anteriorly. The posterior row of eyes is slightly procurved instead of a little recurved as it is in *monticolens*, and the eyes are equidistant, though in the female the medians are obviously more widely separated. Anterior row of eyes conspicuously procurved instead of straight; median eyes much smaller than the laterals, nearer to each other than to the laterals, but much less widely separated from the latter than in *monticolens* in which the convexity carries the medians far forward. Palpus very similar to that of *monticolens;* the tibial apophysis is more strongly and uniformly curved than in the genotypè, in the latter being comparatively straight above the curving basal portion. See Fig. 21, 4 and 5.

Female.—The form of the epigynum is shown in Fig. 21, 6.

Length of male 1.85 mm. Length of cephalothorax .7 mm.; width .58 mm.

Locality.—Utah: Mill Creek. A number of specimens secured by sifting leaves in September.

It will be noted that the less elevated and forwardly protruding head in this form is associated with considerable differences in eye relations from those in the genotype.

CATABRITHORAX gen. nov.

Much resembles Gongylidiellum in its broad cephalothorax with frons much wider than the area occupied by the eyes. Clypeus lower than length of median eye area, in the genotype much so. Anterior row of eyes straight or but very slightly curved, eyes close together, typically less than their radius apart, if any different the median eyes closer than to the laterals, median eyes smaller than the laterals; posterior row of eyes straight, the eyes nearly equidistant, the medians being a little nearer each other than to the laterals. Area of median eyes as wide as or a little wider than long. Anterior tarsi shorter than the metatarsi. In the male palpus the tibia has above at anterior end on mesal side a stout simple hook which curves ectad. The tarsal hook arising at distal end of bulb, where it is stout, runs to base of bulb and then bends back distad, this second part substraight, narrowing distad, unbranched, and free from the bulb. Embolus issuing at distal end of bulb from a tube-like fold. (Cf. Figs.)

Genotype.—*C. clypiellus*, sp. nov.

The structure of the male palpal organ is obviously different from that of *latebricola* Cambridge, type of Gongylidiellum, and the tarsi of the legs are shorter than the metatarsi. The close correspondence of the important features of the palpal organ in the two species here described, while differences in such

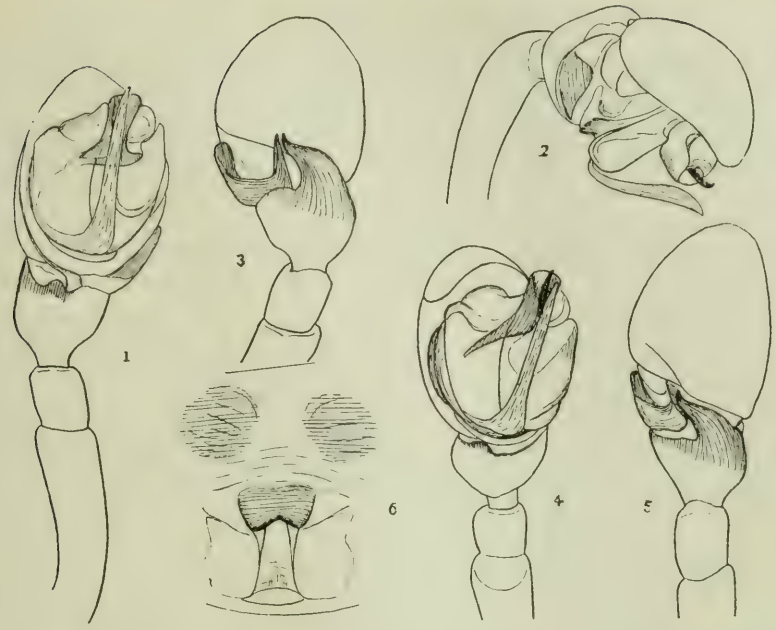

Fig. 22. 1. *Catabrithorax clypiellus*, sp. n., ventral view of left male palpus. x100. 2. Distoectal view of right male palpus. x100. 3. Dorsal view of left male palpus. x100. 6. *Anyphaena intermontana*, sp. n., epigynum. x44.

characters as height of clypeus, etc., are so marked, indicates the importance of the palpal organ in generic distinctions in this group.

Catabrithorax clypiellus, sp. nov.

Male.—Carapace light dusky yellow. Legs yellow. Abdomen light gray. Remarkable for the extremely low clypeus, the height of which is less than the diameter of the lateral eye and does not exceed that of the smaller medians. Anterior row of eyes straight or rather slightly recurved, eyes close together, separated by less than the radius of the median eyes; median eyes smaller than the laterals. Posterior row of eyes straight; eyes equal and equidistant, less than a diameter apart. Area of median eyes as wide as, or very slightly wider than, long, clearly wider behind than in front (ratio about 4:3). Upper margin of furrow of chelicera armed with four teeth, the lower margin with a series of five or six smaller teeth. Sternum broad, shield-shaped, produced between posterior coxæ, posteriorly truncate, strongly convex. Labium very short and broad, distally truncate, not narrowed. Cephalothorax unusually broad and low, the lateral margins widely convex, the anterior end broad, the eye region a little protruding over the clypeus. In the male palpus the tibia presents above a chitinous apophysis which distally curves first outward and then distad. Paracymbium and embolus as shown in Fig. 22, 1, 2 and 3.

Length 1.63 mm. Length of cephalothorax .66 mm.; width .58 mm. Length of tib.+pat. IV nearly equalling width of cephalothorax, the length of tib.+pat. I less than the width of cephalothorax.

Locality.—Utah: Logan Canyon. One male.

Catabrithorax ceuthus, sp. nov.

Male.—Cephalothorax and sternum dusky, almost black, the eye region solid black, the black protruding in a rounded spot on upper median part of clypeus. Legs fulvous, slightly smoky. Abdomen dark grey. Cephalothorax of moderate width; head elevated, sides slanting, eye region protruding above clypeus. Sternum rather narrow in comparison with that of *clypiellus*, conspicuously convex, strongly narrowing from the anterior and caudad, sides but moderately convex, narrowly produced between posterior coxæ. Labium anteriorly weakly convex, narrowing distad. Anterior row of eyes very slightly procurved; median eyes smaller than the laterals, very close together, being less than their radius apart, farther from the laterals. Area of median eyes much narrower in front than behind, fully as wide as long. Posterior row of eyes weakly procurved; eyes equal; median eyes about their radius apart, an equal or scarcely greater distance from the laterals. Clypeus equalling or slightly lower than the length of area of median eyes (ratio about 7:8). Tibia of male palpus with an uncate apophysis above, the hook turning outwards and then distad at tip as in *clypiellus*. Structure of palpal organ very similar to that of *clypiellus*, as shown in Fig. 22, 1, 2 and 3.

Length of cephalothorax .75 mm.; width .58 mm. Length of tib.+pat. I equal to width of cephalothorax or very slightly longer (.6 mm.). Length of tib.+pat. IV .65 mm.

Locality.—Utah: Bear Lake. One male.

Separable at once from the preceding species by its much higher clypeus, etc. It is a darker species.

CLUBIONIDÆ.

Anyphaena intermontana, sp. nov.

Female.—Cephalothorax and legs pale, of a weakly greenish tinge, the legs not at all annulate. Abdomen also pale, the dorsum or side with numerous longitudinal spots or streaks of dark, and the middorsal region behind with indistinct and more or less broken dark chevrons. Anterior row of eyes straight or slightly recurved; median eyes smaller than the laterals, about their radius apart, less than half as far from the laterals. Height of clypeus but little more than equalling the radius of an anterior median eye. Posterior row of eyes a little procurved; eyes subequal; median eyes a little more than their diameter apart, about their diameter from the laterals. Tibia I armed beneath with a subbasal and a submedian pair of spines, the first overlapping the bases of the second; a single spine on anterior face. Tibia II with a single subbasal spine and a pair of submedian spines, none at distal end.

Epigynum as shown in Fig. 22, 6.

Length 5.8 mm. Length of cephalothorax 2.6 mm. Length of tib.+pat. I 2.75 mm.

Locality.—Utah: Mill Creek.

In the form of epigynum suggesting *A. pacifica* (Banks), known from the State of Washington, though this is proportionately shorter and is broader anteriorly, with the median channel less elongate, etc. It is readily separable

by the characters of the eyes, the anterior row in *pacifica* being distinctly procurved instead of straight or slightly recurved, with the eyes obviously more widely separated and the medians clearly smaller relatively to the laterals, the clypeus higher, etc. In *pacifica* tibia I bears in front two spines instead of one, the ventral spines do not typically overlap, and tibia II is armed with a spine at the distal end.

A NOTE ON THE WINGLESS TIPULID *CHIONEA VALGA* HARRIS.

BY R. C. TREHERNE,
Entomological Branch, Dominion Department of Agriculture.

During March, 1920, Mr. H. J. Blurton, trapper, of Mara, B. C., brought into my office some specimens of insects taken from above snow line at the north end of the Okanagan Valley. One of these insects has turned out to be the wingless tipulid *Chionea valga* Harris, and it constitutes a new record from the West. The determination was made by Dr. Nathan Banks through Dr. J. McDunnough, of Ottawa, and my attention was drawn to the article on this genus that appears in Psyche, Vol. XXIV, p. 142, October, 1917, by Dr. Werner Marchand of the Department of Animal Pathology, the Rockefeller Institute for Medical Research, Princeton, New Jersey. Owing to the interest of this capture I requested Mr. Blurton to give me the leading notes of his observations for record and publication. These notes follow, arranged in manuscript form.

"I have noticed them for many years in the Hunter's Range of Mountains, east of Mara, B. C., and they have always attracted my attention by their peculiarities in regard to the altitude they live at in the mountains, their mode of travel, and the weather conditions they seem to prefer. These insects seem to live principally between 5,000 and 6,500 feet above sea level, and in a country where spruce and balsam trees grow, living principally in the large, open spaces near timber line, but very seldom where timber is plentiful. When travelling over the snow they always appear to be in a great hurry, and they move in nearly straight lines from one point to another, not travelling in an erratic manner at all, but as if they had some special destination in mind. I noticed when I approached one that it would crouch down when I am near, as if it could feel the vibrations in the snow made by the weight of my snowshoes falling on the snow, and would remain motionless until I had passed. This habit is not invariable, but it happens often enough to be noticeable, showing that this species is either sensitive to vibrations in the snow or to the sounds made by my movements.

It is very noticeable that this insect only selects cold, snowy weather to travel in, and it is very active on the surface of the snow during the months of January, February, March and April, even when the temperature is below zero. If the atmospheric temperature is warm enough to make the snow surface moist they apparently do not travel. I have noticed in April that if the sun in the morning shone brightly, causing a slight thaw, there would be a few *Chionea* visible, but if the weather changed in the afternoon and became colder with a flurry of snow that large numbers of *Chionea* both males and females, came hurrying from all directions. The adults seem very sensitive to warmth and will die in a few minutes if carried in a warm hand, although if placed on the

snow before they are quite dead, they will soon commence to struggle, stretch their legs and eventually recover entirely. I also noticed that if carried in a closed match box in one of my pockets they only lived a very few hours; possibly a large male, under these circumstances, might live 3 to 4 hours. If they were walking over the snow and my warm hand was placed near them they would hurry away from it. On the other hand, they would walk quite freely over my snowshoes, which of course were cold, thus proving to me that it is warmth that they retreat from.

There is another peculiar feature in their habits that I have noticed. They have an extremely strong grip, and it is very difficult indeed to shake them loose from anything to which they are attached. For instance, it is hardly possible to shake them loose from the match-box in which I have frequently stored them when collecting, and it is equally difficult to remove them from sticks or thongs of snowshoes.

Apparently their object in travelling so rapidly over the snow is to enable the sexes to come together. When they were active on stormy days in April, I have captured numbers of both sexes, placing them in my collecting box, and it was only a few moments before copulation took place. The sexual grip is also very strong, it being retained even when placed in alcohol.

My attention has been drawn to the article in Psyche by Werner Marchand, who mentions that *Chionea* is affected by the warmth of the hand and that it travels in straight lines. I could have made fuller observations on this insect if I had known it was of interest. For instance, I could have found out whether copulation takes place in other months than April. It was my belief that *Chionea* was predaceous on the snow fleas but I have changed my opinion, the snow fleas being very active in warm, thawing weather, whereas *Chionea* is not abroad in such weather except to a very limited extent."

CORRECTIONS TO MR. GUNTHORP'S SUMMARY OF WOOD'S MYRIOPODA PAPERS.

It seems desirable for the benefit of those not familiar with the literature of the subject to call attention to certain inaccuracies in Mr. Gunthorp's recent "Summary of Wood's Myriapoda Papers."*

1. Mr. Gunthorp states that Wood's first paper "described four species as new." As a matter of fact twenty new species are there described.

2. Likewise incorrect is the statement that in the second paper, "On the Chilopoda," "twenty-nine new species are included." There are really forty-five described as new.

3. It is written that Wood's paper on "New Polyzoniidæ" is "the one paper he wrote on foreign material." On the contrary, Wood's first paper, mentioned above, is based chiefly on foreign material, sixteen of the twenty new forms described being exotic; and in the second paper, on the Chilopoda, seventeen exotic species are described as new.

4. The number of species described by Dr. Wood "from elsewhere" than the United States is said to be two. The number is actually thirty-five.

*Canadian Entomologist, May, 1920, p. 112.

5. It may be added that in summarizing the genera and species to be credited to Wood, Mr. Gunthorp does not take into consideration those now suppressed as synonyms. Similarly it should have been indicated that the list of species from the United States simply records them as given by Wood, no indication being given of their present generic position or of those relegated to synonymy. Thus, the generic names Cermatia, Opisthemega, and Strigamia are no longer in use, having been antedated by other names; and the species listed under Strigamia, Julus, Polydesmus, etc., are now known to represent a variety of different genera and families.

6. It is stated that Dr. Wood wrote several papers in the Insecta. This seems to be erroneous, as there is no record of his ever having published anything on insects proper. R. V. CHAMBERLIN.

WOOD-BORING BEETLES OF BLACK LOCUST.

BY O. W. ROSEWALL,
Louisiana State University, Baton Rouge, La.

From time to time it has been noticed that wood-boring insects were plentiful in the dead or partly dead, young Black Locust trees (*Robinia pseudacacia*) in the University Arboretum. During the past year some of the infested wood was placed in glass containers in the University Insectary, and the following beetles were reared:

Order Coleoptera—
- Family Bostrichidæ—
  - *Sinoxylon basilare*, Say.
- Family Buprestidæ—
  - *Agrilus egenus* Gory.
- Family Cerambycidæ—
  - *Ecyrus dasycerus* Say.
  - *Liopus alpha* Say.
  - *Liopus fascicularis* Harr.
  - *Liopus variegatus* Hald.
  - *Neoclytus erythrocephalus* Fab.
  - *Phyton pallidum* Say.

The above-named beetles emerged from about 15 feet of the wood, of which none was over ¾ of an inch in diameter and most of it less than ½ inch in diameter. Practically all the limbs had been removed from these small trees, so the larvæ had attacked the main part of the trees.

The beetles emerged in numbers and dates as follows:

Of *S. basilare* Say., 4 emerged respectively on the following dates, March 23, April 6, May 1 and July 25; of *A. egenus* Gory., 3 emerged respectively on April 5, May 1 and July 1; of *E. dasycerus* Say., 10 emerged between the dates April 21 and June 15; of *L. alpha* Say., 1 emerged on May 1; of *L. fascicularis* Harr., 31 emerged between the dates April 12 and May 2; of *L. variegatus* Hald., 1 emerged on April 2; of *N. erythrocephalus* Fab., 2 emerged respectively on April 1 and May 13; of *P. pallidum* Say., 13 emerged between the dates of April 16 and May 21.

A BIBLIOGRAPHY OF THE LITERATURE ON THE DESCRIBED TRANSFORMATIONS AND FOOD PLANTS OF NORTH AMERICAN SPECIES OF AGRILUS (COL.).

BY C. A. FROST AND H. B. WEISS.*
New Brunswick, N. J.

In 1900 Chittenden published a paper on the "Food Plants and Injury of North American Species of Agrilus,"[1] in which 31 species were listed together with notes on food plants and injury. Since this paper, nothing of a similar nature has appeared, and during the period between 1900 and 1920 new species have been described and much additional biologic information on several economic species has accumulated The present paper, therefore, brings together to date all of the references to the literature on the life-histories, habits and food plants of those of our North American species about which such information is known, supplemented by very brief notes on the important economic ones.

The habits of such species as *vittaticollis* Rand., *bilineatus* Web., *anxius* Gory, *ruficollis* Fab., and *sinuatus* Oliv., appear to be fairly well known, due undoubtedly to their activities as enemies of cultivated and forest trees and plants which necessitated studies. The habits of many other members of this extensive genus are less completely known and of a large number nothing whatever concerning food plants, etc., appears to have been recorded. In the list which follows, references to the places of original description and geographical distribution have been omitted as such information can be found in Leng's "List of the Coleoptera of North America."

List of Species and References.

A. ferrisi Dury.

Blatchley, Col. Ind., p. 798, 1910.

Dury, Ent. News XIX, p. 368, 1908.

Occurs on hackberry (*Celtis occidentalis*) in twigs of which the larvæ bore (Blatchley). Beaten from hackberry (Dury).

A. difficilis Gory.

Chittenden, Bull. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

Uhler, Proc. Acad. Phila., Vol. VII, p. 416, 1855.

Obtained from a species of willow (Uhler).

A. ruficollis Fab.

Caesar, Ont. Ent. So. Rept. 42, p. 31, 1912.

Chittenden, Bull. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

" U. S. D. A. Yearbook, pp. 726–733, 1902.

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*The arrangement of the authors' names is alphabetical.

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" 10th Rept. Inj. Other. Ins. N. Y., 1895.
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Riley, Amer. Ent., Vol. II, p. 128, 1870.
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Saunders, Rept. Ent. Soc. Ont., pp. 7–17, 1873.
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Slingerland & Crosby, Man. Fruit Ins., p. 332, 1912.
Smith, Ins. Life, Vol. IV, pp. 27–30, 1891.
" 22nd Ann. Rept. Ent. Soc. Ont., pp. 52–54, 1891.
" Spec. Bul. N., N. J. Agric. Exp. Sta., Nov., pp. 4–8, 1891.
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Walsh & Riley, Amer. Ent., Vol. II, 1869–1870.
Washburn, 9th Rept. St. Ent. Minn., 1904.
" Minn. Circ. 29, 1914.
Webster, Bul. 45, Ohio Agric. Exp. Sta., pp. 151–217, 1893.
" Ohio Farmer 3, May, p. 357, 1894.

This is the common red-necked cane-borer of blackberry, dewberry and raspberry. The egg is inserted in the bark near the base of a leaf in the new growth and the larva burrows upward in the sapwood going around the stem in a spiral course, thus girdling the cane and causing an irregular swelling or gall, varying from 1 to 3 inches in length, and bearing longitudinal slits or splittings.

A. lateralis Say.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.
On poplar sprouts (Blanchard). Beating *Alnus incana* (Frost).

A. otiosus Say.

Blatchley, Col. Ind., p. 798, 1910.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Hamilton, Trans. Am. Ent. Soc., Vol. XXII, p. 364, 1895.
Knull, Ent. News, Vol. XXXI, p. 8, 1920.
Packard, 5th Rept. U. S. Ent. Comm., p. 367, 1890.
Smith, Ins. N. J., p. 295, 1909.

Occurs on foliage of oak and hickory (Blatchley). Breeds in hickory, oak, locust, etc., (Smith). Attacks maple, dogwood, redbud, hickory, black walnut (this may refer to *juglandis* Knull), and probably infests butternut, box-elder, oak and perhaps locust (Chittenden). Hickory is host: reared from dead branches of persimmon (*Diospyros virginiana*) (Knull). On *Corylus americana* leaves and oak leaves (Frost).

A. juglandis Knull.

Knull, Ent. News, Vol. XXXI, p. 8, 1920.

Breeds in outer bark of living butternut (*Juglans cinerea*) (Knull).

A. frosti Knull.

From leaves of oak and hickory (Frost).

A. defectus Lec.

Knull, Ent. News, Vol. XXXI, p. 10, 1920.

Reared from dead branches of white oak (*Quercus alba*) (Knull). On oak leaves (Frost).

A. crinicornis Horn.

Frost, Can. Ent., Vol. XLVII, p. 144, 1915.

On leaves of red raspberry (Frost).

A. masculinus Horn.

Blatchley, Col. Ind., p. 799, 1910.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.
Knull, Ent. News, Vol. XXXI, p. 10, 1920.
Stromberg, Can. Ent., Vol. XXVI, p. 36.

On box-elder (Stromberg). On foliage of buckeye (Blatchley). Reared from sapwood of dead box-elder (*Acer negundo*) (Knull). On red oak leaves (Frost).

A. arcuatus Say.

Blatchley, Col. Ind., p. 799, 1910.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.
Knull, Ent. News, Vol. XXXI, p. 10, 1920.
Ruggles, 17th Rept. St. Ent. Minn., p. 15, 1918.
Stromberg, Can. Ent., Vol. XXVI, p. 36.

This species is the oak twig girdler. The egg is deposited on the side of the twig near the terminal bud, and the resulting larva encircles the twig beneath the bark, causing the death of the part beyond the burrows. The adults feed on the foliage, eating out irregular patches near the edges of the leaves.

Reared from girdled branches of beech (*Fagus americana*) and hickory (*Hicoria ovata*) (Knull).

A. arcuatus var. **coryli** Horn.

Blanchard, Ent. Amer. Vol. V, p. 32, 1889.
Blatchley, Col. Ind., p. 799, 1910.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.
Frost, Can. Ent., Vol. XLVIII., p. 386, 1916.
Hamilton, Trans. Am. Ent. Soc., p. 364, 1895.

On hazel (*Corylus americana*) (Blanchard). On hazelnut (Blatchley).

On *Corylus americana* and *C. rostrata* (Frost).

A. arcuatus var. **torquatus,** Lec.

Ruggles, 17th Rept. St. Ent. Minn., p. 15, 1918.

The habits of this variety are similar to those of *A. arcuatus.*

A. cupricollis Gory.

Blatchley, Can. Ent., Vol. LI, p. 29, 1919.

Occurs on huckleberry and other low shrubs (Blatchley).

A. angelicus Horn.

Rohwer, Proc. Ent. Soc. Wash., Vol. XXI, pp. 4–8, 1919.

Infests *Quercus agrifolia.*

A. champlaini Frost.

Britton, Rept. Conn. Agric. Exp. Sta., pp. 291–296, 1912.

Frost, Can. Ent., Vol. XLIV., p. 245, 1912.

The larva of this species causes conspicuous swellings or galls on the branches of the hop hornbeam or ironwood (*Ostrya virginica*).

A. townsendi Fall.

Fall, Tr. Am. Ent. Soc., Vol. XXXIII, p. 234, 1907.

Beaten from *Quercus gambellii* (Townsend).

A. macer Lec.

Chittenden, Bull. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Injurious to *Celtis occidentalis* in Texas (Schwarz).

A. vittaticollis Rand.

Austin, Proc. Bost. Soc. Nat. His., Vol. XVII, p. 276, 1875.

Blanchard, Ent. Amer., Vol. V, p. 32, 1889.

Blatchley, Col. Ind., p. 800, 1910.

Brooks, Jour. Agric. Res., Vol. III, 2, pp. 179–185, 1914.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Hamilton, Tr. Amer. Ent. Soc., Vol. XXII, p. 364, 1895.

Knull, Ent. News, Vol. XXXI, p. 10, 1920.

Smith, Ins. N. J., p. 295, 1909.

This species, known as the apple root borer, has recently been investigated by Brooks. Eggs are glued to the trunk close to the ground and the larva bores directly through the bark to the cambium, and then through the cambium down the trunk to the ground and outward through a convenient root, finally entering the solid wood of the root where much feeding is done.

Seems to live on shadberry (*Amelanchier canadensis*) (Austin). Feeding on leaves of thorn, shadbush and chokecherry (Blanchard). On leaves of *Oxydendrum* (Fiske). Larva attacks apple, pear, wild thorn, wild crab and service (Brooks). From leaves of *Pyrus* and *Amelanchier* (Frost).

A. dozieri Fisher.

Fisher, Proc. Ent. Soc. Wash., p. 67, 1918.

On foliage of blue birch (*Ostrya* sp.) (Fisher).

A. bilineatus Web.

Anderson & Rankin, N. Y. Cornell Bul. 347, 586, 1914.

Britton, Conn. Rept. 13, p. 250, 1914.

Burgess, U. S. Farmers Bull. 564, p. 5, 1914.

Burke, U. S. D. A. Year Book, p. 401, 1909.

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Chittenden, U. S. D. A., Div. Ent. Circ. 24, 2nd ser. pp. 1–8, 1897.
" U. S. D. A., Div. Ent. Bul. 7, n. s., pp. 67–75, 1897.
" U. S. D. A., Div. Ent. Bul. 22, n. s., pp. 51–64, 1900.
" U. S. D. A., Year Book, pp. 726–733, 1902.
Felt, N. Y. St. Mus. Mem. 8, p. 280, 1905.
" N. Y. Rept. 27, p. 113, 1912.
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Hamilton, Trans. Am. Ent. Soc., Vol. XXII, p. 364, 1895.
Harrington, 27th Ann. Rept. Ent. Soc. Ont., p. 71, 1896.
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Howard, U. S. R. Ent., p. 11, 1914.
Johnson, Ann. Rept. Pa. Dept. Agric., pp. 345–64, 1896.
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Metcalf & Collins, U. S. Farmers' Bul. 467, p. 10, 1911.
Packard, 5th Rept. U. S. Ent. Comm., p. 222, 1890.
Ruggles, 15th Rept. St. Ent. Minn., p. 54, 1914.
" 14th Rept. St. Ent. Minn., p. 55, 1911–1912.
Smith, N. J. Rept., p. 348, 1910.
" Ins. N. J., p. 295, 1909.
Washburn, Minn. Rept. 14, p. 55, 1912.
" U. S. D. A., Year Book, p. 515, 1906.
" U. S. D. A., Year Book, pp. 574–578, 1908.

The two-lined chestnut borer is known as a serious pest of chestnuts and oaks. Eggs are deposited in small clusters in bark crevices and the winding larval burrows are made in the wood and cambium layer, and occur on the tree from small branches less than an inch in diameter down to the roots. The adults usually eat around the margins of the leaves, but also tear off the epidermis and at times consume nearly the entire leaf, including the midrib.

On trunk of dead white oak and red oak leaves (Frost).

A. auroguttatus Schaef.

Schaeffer, Brook. Inst. Mus. Sci. Bul. 1, 7, p. 149, 1905.

Beating branches of black oak (Schaeffer).

A. granulatus Say.

Blanchard, Ent. Amer., Vol. V, p. 32, 1889.
Burrill, 12th Rept. St. Ent. Ill., pp. 121–122, 1883.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.
Manee, Ent. News, Vol. XXIV, pp. 167–171, 1913.
Packard, 5th Rept. U. S. Ent. Comm., p. 443, 1890.

Burrill states that the larva of this species makes tortuous galleries in the living tissue of the Lombardy poplar, these galleries running for the most part in irregularly horizontal directions across the grain of the wood.

Swept from *Salix* leaves at Littleton, Col. (Frost).

A. pensus Horn.

Frost, Can. Ent., Vol. XLVII, p. 144, 1915.

On leaves of *Ostrya* and beaten from *Alnus incana* (Frost).

A. anxius Gory.

Burke, U. S. D. A., Year Book, p. 403, 1909.
Chamberlain, Sci. Amer. 20, Jan., p. 42, 1900.
Chittenden, U. S. D. A., Div. Ent. Bul. 18, n. s., pp. 44–51, 1898.
" U. S. D. A., Div. Ent. Bul. 22, n. s., pp. 64–68, 1900.
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Davis, Jour. Econ. Ent., Vol. III, p. 184, 1910.
" Ins. Life, Vol. IV, p. 66 (*torpidus*).
Felt, Count. Gentl. Dec. 15, p. 993, 1898.
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Fernald, Jour. Econ. Ent., Vol. V, p. 246, 1912.
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Gibson, Ont. Ent. Soc. Rept. 40, p. 13, 1910.
Hopkins, U. S. D. A., Div. Ent. Bul. 48, 1904.
Houser, Bul. 332, Ohio Agric. Exp. Sta., p. 326, 1918.
Hutchings, 9th Ann. Rept. Quebec Soc. Prot. Pl. p. 65, 70, 1916.
Knull, Ent. News, Vol. XXXI, p. 10, 1920.
Lochhead, Rept. Ont. Agric. Coll. & Exp. Farms, 1902.
Ruggles, 14th Rept. St. Minn., p. 57, 1911, 1912.
Sanders, Wis. Bul. 227, p. 22, 1912.
Slingerland, Proc. West. N. Y. Hort. Soc., Apl., 1899.
" N. Y. Cornell Bul. 234, 1906.
Smith, Ins. N. J., p. 295, 1909.
" N. J. Rept., p. 415, 1909.
" N. J. Rept., p. 348, 1910.
Swaine, Ont. Ent. Soc. Rept. 43, p. 91, 1913.
" 7th Ann. Rept. Quebec Soc. Prot. Pl., pp. 91–115, 1915.
" Can. Fores. Jour., Vol. XIII, p. 1928, 1918.
Turner, Ga. Bd. Ent. Bul. 49, p. 28, 1918.
Washburn, Minn. Rept. 12, p. 98, 1908.
" Minn. Rept. 14, p. 57, 1912.
" U. S. D. A., Year Book, p. 550, 1907.
" U. S. D. A., Year Book, p. 578, 1908.

Known as the bronze birch borer, this species is a serious pest of the birches. Eggs are deposited in crevices in the bark and the first tunnels constructed by the larvæ lie close under the bark. As feeding continues, the burrows are

extended without particular definiteness and extend deep into the wood or near the bark, and become much convoluted affairs. The result is a fatal girdling. Dark reddish-brown spots often form on the bark above where the tissue is riddled. Various species of birch are attacked. Mr. W. F. Turner records this species as infesting pecan. Burke states that it attacks poplars, cottonwoods, aspens and balm-of-gileads. Galls on branches of willow (Davis). On poplar leaves and ovipositing in trunk of living poplar (Frost). Where the references refer to birch and poplar, they are undoubtedly correct, but there is a possibility of *anxius* having been confused with other species where other food plants are mentioned.

A. acutipennis Mann.

Blanchard, Ent. Amer., Vol. V, p. 32, 1889.
Blanchard, Tr. Am. Ent. Soc., Vol. XVIII, p. 308.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

On foliage of oak shrubs (Blanchard). On foliage of *Corylus americana* and red oak (Frost).

A. auricomus Frost.

Frost, Can. Ent., Vol. XLIV, p. 250, 1912.

A. couesii Lec.

Chittenden, Bul 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.
Cockerell, Jour. N. Y. Ent. Soc., p. 150, 1897.
On *Mentzelia nuda* (Cockerell).

A. pulchellus Blanch.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.
Breeds in roots of *Erigeron* (Hubbard & Schwarz).

A. cephalicus Lec.

Knull, Ent. News, Vol. XXXI, p. 10, 1920.

Reared from sapwood of dead dogwood (*Cornus florida*) (Knull). On leaves of *Corylus americana* (Frost).

(To be continued.)

DR. SEYMOUR HADWEN.

It will be regretted by many Entomologists and others throughout Canada that Dr. Seymour Hadwen, Pathologist of the Health of Animals Branch, Dominion Department of Agriculture, tendered his resignation and left Ottawa about the middle of June. He is to be congratulated, however, on being appointed Chief Pathologist of the United States Biological Survey. Dr. Hadwen, accompanied by Dr. Nelson, Chief of the Biological Survey, sailed for Alaska, from Seattle, on July 1st, to undertake a series of studies on the diseases affecting the reindeer and caribou. Dr. Hawden will have several technical assistants with him, and a complete laboratory outfit from Washington accompanied the party. Their headquarters will be about one hundred miles inland from Nome.—Adapted from the "Entomological Branch News Letter."

NEW COLEOPTERA. IX.

BY H. C. FALL,
Tyngsboro, Mass.

OMOPHRON Lat.

O. decoloratum, sp. nov.

Broadly oval, form nearly as in *robustum*, size a little larger than the latter, color above testaceous, beneath brown fading to yellow at the margins; markings similar in form and position to those of *robustum* except that the transverse frontal plaga is not produced forward at middle, the sutural stripe is not dilated before the apex, and they are throughout of a pale brownish tint, without trace of metallic lustre. The surface throughout is polished and strongly shining, the elytral striæ fine, entire and set with rather distant punctures.

Length 6.7 to 6.9 mm.; width 4.5 to 4.6 mm.

Described from three examples bearing label Gray Co., Kansas, July 9–15, 1917. Specimens were sent me by Mr. W. Knaus, who received them from the University of Kansas. The type is a female.

This species falls with *pallidum* and *robustum* by Casey's table.* *Pallidum* differs distinctly by its smaller size and dull alutaceous lustre, in which it resembles *gilæ*. *Decoloratum* is more nearly allied to *robustum*, but the pale, washed-out and rather small and indefinite markings, which are not at all due to immaturity, readily distinguish it.

In the Canadian Entomologist—1909, p. 276—Casey describes *O. brevipenne* from Ohio specimens. As its author remarks, this is the species which generally goes as *robustum* in collections. A careful comparison of Ohio specimens with the type of *robustum* shows them to be practically identical in all respects. The unique type of *robustum* was described as coming from Nova Scotia, but so far as I know no other specimens have been taken in that region, and I very much doubt the correctness of the locality; in any case it is quite certain that the Ohio specimens are the same thing.

HETEROCERUS Fab.

Among a lot of miscellaneous Manitoban things recently sent for determination by Messrs. Wallis and Criddle, I find two undescribed species of this genus. It is especially noteworthy that both belong to the subgenus *Littorimus*, of which Horn recognized but a single representative in his Synopsis of the North American species. Opportunity is taken to make known two other undescribed species, one of them a *Littorimus*, which have stood in my collection for many years.

H. minutus, sp. nov.

Very small; entire body and appendages testaceous, the head sometimes feebly infuscate; pubescence short, pale, marginal fringe short. Head and thorax densely, very finely punctate; elytra finely punctate, the punctures separated by about their own diameters, the interspaces excessively minutely punctulate. Prothorax (♂) strongly transverse, evidently wider than the elytra, sides moderately arcuate, not narrowed in front, with the usual apical and basal constrictions, base not visibly margined. Elytra without trace of striæ, but with a broad sulcus extending tending backward from the intrahumeral

*Coleopt. Notices VII, p. 301.

impression, becoming gradually evanescent behind the middle. Metasternum without mesocoxal line, epipleuræ without raised line at base.

Length 1.6 mm.

Luling, Texas, three examples taken by the writer July 4–6, 1893. Two of the three specimens are quite surely males, judging from the broad parallel-sided prothorax; the third has the thorax equal in width to the elytra, but is scarcely more narrowed in front than in the other two; it may be a female. The type is a male.

This minute species is obviously closely related to *pusillus* but the size is conspicuously smaller, the base of the thorax is unmargined, and the male shows no trace of the mandibular lobe which is characteristic of *pusillus*. Horn describes *pusillus* as having the mesocoxal line, but says it is indistinct. There is absolutely no trace of the line in any one of my specimens.

H. mundulus, sp. nov.

Pale flavo-testaceous throughout, elytra with a small, vague fuscous shade behind the scutellum, the labrum also more or less infuscate; pubescence fine short, concolorous, the marginal fringe inconspicuous; entire upper surface very finely densely punctulate. Prothorax moderately transverse, equal in width to the elytra (♂) or slightly wider (♀), with the sides feebly arcuate and subparallel, basal sinuation not distinctly margined. Elytra without striæ. Body beneath finely densely punctulate, metasternum often a little infuscate. Mesocoxal line indistinct but usually traceable, no epipleural line; stridulating ridge of first ventral segment complete.

Length 2.6–2.9 mm.

El Paso, Texas. Nov. 13, 1889. Twelve examples.

This pallid little species together with the much larger *H. pallidus* were seen in abundance on the wing just before sunset in the dry, sandy bed of the Rio Grande on the above-mentioned date. It is only recently that I have discovered the species to be a *Littorimus*. There is very little difference in the form of the thorax in the specimens before me, and I feel somewhat uncertain as to the sexes. In one or two the thorax and head seem slightly larger than the rest, and it is probable that these are males. The metasternal intercoxal process is barely as wide as the coxal width in this species, much narrower than in the other species of *Littorimus*.

H. moleculus, sp. nov.

Form oblong, obtuse at the extremities, as in *auromicans;* colour piceous, sides and median line of prothorax obscure testaceous, elytra with irregular, often interrupted pale fasciæ of the usual type, which vary greatly in development; pubescence very fine, short, yellowish and recurved on the elytra, darker and erect on the prothorax, margin not fimbriate with longer hairs. Head and thorax densely minutely punctulate, elytra with a dual punctuation consisting of relatively coarse punctures separated by their own diameters on the average, the interspaces very minutely punctulate. Prothorax nearly twice as wide as long, as wide as the elytra in the female, just perceptibly wider in the male, sides nearly parallel, feebly narrowed apically, sides of base a little oblique, and very distinctly margined. Elytra not at all striate. Body beneath piceous, legs, tip of prosternal lobe, pro- and epipleuræ and margins of ventral seg-

ments testaceous; mesocoxal and epipleural lines present; stridulating ridge of first ventral entire.

Length 2.2–2.4 mm.

The type bears label "Aweme, Man. 3–IX–1917, M. Criddle." Other examples from Mr. Criddle and Mr. Wallis from same locality bear date 15–VII.

This very small species resembles considerably in miniature *auromicans*, but aside from the size differs in its somewhat finer pubescence and in the character of the elytral punctuation. In *auromicans* the elytral punctures are sensibly equal in size throughout and finer than the coarser punctures of *moleculus*. The pale elytral markings in *moleculus* are usually broader and more confluent, such that frequently they might better be described as testaceous, with base and some detached spots piceous.

H. canadensis, sp. nov.

Similar to the preceding species, except as follows: Size larger, length 3.3 mm., colour piceous except for two narrow sinuous elytral fasciæ and small subapical spot; the propleura and sides of ventral segments obscurely paler; legs entirely dark; pubescence longer, the recurved hairs of the elytra mixed abundantly throughout with short erect hairs; margins of prothorax and elytra distinctly fimbriate. The very fine interstitial punctures of the elytra are fewer and less evident and the larger punctures more conspicuous than in *moleculus*.

Described from a single female specimen taken at Thornhill, Manitoba, I–VII–16 by Mr. J. B. Wallis. Type in my collection.

The four species of the subgenus *Littorimus* now known to me may be easily separated by the following table:

Colour pale testaceous without markings; middle coxæ separated by a distance subequal in width to that of the coxa; base of thorax not margined at sides; epipleuræ without oblique raised line at base; length 2.3–2.9 mm.....*mundulus*.

Colour piceous; elytra fasciate; middle coxæ separated by a distance distinctly greater than the width of the coxa; base of thorax very distinctly margined at sides; epipleural line present.

Margins of body distinctly fimbriate with longer hairs; elytra with abundant intermixed short erect hairs; legs dark; length 3.3 mm.....*canadensis*.

Margins of body not fringed with notably longer hairs; elytral pubescence recurved or recumbent; legs entirely or in great part pale.

Size very small (about 2.3 mm.) elytral punctuation dual....*moleculus*.

Size much larger (3. to 4. mm.) elytral punctures nearly uniform in size.....*auromicans*.

OLIGOMERODES Fall.

O. delicatulus, sp. nov.

Form narrow, cylindrical, body piceous, clothed with short ashy appressed pubescence, legs and antennæ brown. Antennæ (♂) very slender, nearly as long as the entire body, first joint relatively stout, arcuately subcylindrical, about twice as long as wide, joint 2 obconic, half as long as the first, 3–8 narrower

and of equal width, not in the least serrate, 3–5 decreasing in length, 3 a little longer than wide, 5 wider than long, 6–8 strongly transverse and compactly joined, 9–11 extremely slender and elongate, 9 about 6 times as long as wide and fully as long as the preceding joints combined, 10 a little longer and feebly arcuate throughout its length, 11 straight, still longer, 9–11 combined nearly as long as the elytra. Head deflexed, finely sparsely punctate; eyes round, prominent. Prothorax about as wide as long, convex, disk a little gibbous profile, side margins narrowly flattened, subparallel medially, narrowed a little anteriorly posteriorly sinuately curved into the rounded base, the edge finely serrulate anteriorly, surface finely, not closely punctate. Elytra scarcely wider at base than the prothorax, 2½ times as long as wide, disk with feebly impressed rows of fine punctures, the striæ a little deeper at sides. Legs, especially the tibiæ and tarsi, very slender, basal joint of hind tarsus scarcely as long as the next two, fourth tarsal joint not perceptably emarginate.

Length 2.85 mm.; width .9 mm.

Described from a single male specimen taken at San Diego, California, 7–16–1909, by Mr. George H. Field.

Although very different in facies from the two known species of this genus, because of the smaller size and more slender build, there is really little upon which to found a new genus, the most conspicuous feature being the extreme length of the three outer joints of the male antennæ. In this connection it should be remembered that there are numerous instances of marked variation in antennal structure within generic limits in this family, and in the genus Oligomerodes the two known species differ appreciably in this respect, the antennæ in *catalinæ* vary considerably from *occidentalis* in the direction of the present species.

HADROBREGMUS Thoms.

H. subconnatus, sp. nov.

Elongate, parallel, moderately convex, brown, opaque, with short, fine, sparse yellowish appressed pubescence. Second and third joints of antennæ smallest, the latter narrower, joints 4–8 subequal, not quite as wide as long, 9–11 subequal to all the preceding in the male, joint 9 about 2½ times as long as wide and a little longer than the two preceding, joint 10 similar to 9 but scarcely as long, 11 three times as long as wide. In the female joints 9–11 are a little shorter than all those preceding, 9 and 10 each scarcely twice as long as wide. Prothorax, when viewed at right angles to the plane of its side margins, is obviously though not greatly wider than long, suboctagonal in outline, sides straight and nearly parallel medially, obliquely narrowed before and behind, the posterior obliquity sinuate, hind margin evenly arcuate, front margin with a short, feeble median sinuation; surface, like that of the head, finely rugulose and feebly granulose; front angles, posterior margin and median line impressed. Elytra slightly wider at base than the prothorax, sides feebly sinuate before the middle, slightly dilated posteriorly, apex rather narrowly truncate; disk punctate-striate, the interspaces finely rugulose, subequal in width to the striæ, nearly flat toward the suture, a little convex laterally. Body beneath alutaceous and minutely punctulate; ventral segments subconnate at middle, first segment short, 2–4 subequal, 5 longer; last two ventral sutures anteriorly arcuate, the

last more distinctly so. Tarsi slender, basal joint slightly shorter than the two following united, 2–4 subequal, 5 a little longer.

Length 3.25 to 4.5 mm.; width 1.35 to 1.9 mm.

Described from a series of six specimens sent me by Mr. Norman Criddle, who took them at Aweme, Manitoba, 7–VI–1919, in rotten spruce. The type is a male in my own collection; paratypes in Mr. Criddle's collection, these probably to be deposited in the national collection at Ottawa.

Because of the partially connate ventral segments, the present species cannot with strict propriety be referred to Hadrobregmus, in which the ventral segments are perfectly free. Furthermore, the prothorax lacks the postmedian dorsal compression or gibbosity common in varying degree to all species of Hadrobregmus, and presents somewhat the aspect of a Coelostethus, so that strictly speaking, it would occupy a place between these two genera, under a new generic title; but since in all other essentials it is in close accord with Hadrobregmus, I prefer for the present to leave it there, placing it at the end of the genus.

A NEW CALIFORNIA METHIA.

BY J. O. MARTIN,
Berkeley, California.

The genus Methia is so sparsely represented in the collections of California coleopterists and in fact in most collections elsewhere, that I am going to submit the following description of an unique example which appears to differ from any of the yet described species. The specimen on which the following description is based was taken by myself on the desert side of the San Bernardino mountains near Hesperia at the junction of Deep Creek with the Mojave River. It came to my camp light just after a thunder storm.

Methia falli, sp. nov.

Body varying in colour from rufo-castaneous on the head to piceous on the abdominal segments; moderately to sparsely covered with pale yellowish pubescence. Head rufo-castaneous, markedly darker than the disc of the prothorax; front granulose punctate; occiput shining and coarsely variolately punctate, punctures extending more sparsely along the caudal margin of neck, which is shining, and behind the lower lobe of the eye strigose. Eyes large, separated above by about the width of the third antennal joint, deeply emarginate, the upper and lower lobes connected by but two rows of facets.

Antennæ one-half longer than body, rufo-testaceous, gradually slightly darker toward tip; pubescence erect on basal joints becoming decumbent toward the tip; joints three to eleven gradually decreasing in length. Prothorax rufo-castaneous, granulate, moderately constricted at base and apex, sides broadly and evenly rounded. Elytra three-fourths the length of abdomen; lighter in colour than the prothorax, vaguely clouded with black on basal third, more strongly so at the evenly rounded tips; surface granular, dull; bicarinate, the carinæ not meeting and extending but two-thirds of length.

Legs of same colour as elytra. Abdomen nigro-piceous, evenly, sparsely, coarsely punctured. Length 7 mm.

The above like *aestiva* Fall, has the second antennal joint visible but very small.

Falli is more nearly like *aestiva* Fall, than any of the other species of this genus, but differs from it in its darker colour and smaller size; in having the eyes more widely separated on the vertex and the upper lobe of the eye more flattened; also in the possession of the punctured area on the occiput, and the more evenly and broadly rounded outline of the lateral prothoracic profile. In *aestiva* there is a pronounced tooth at the tip of the basal joint of the antennæ which is lacking in *falli*. Type in my own collection.

I take pleasure in naming this species for my friend Mr. H. C. Fall, whose help and kindness has been an inspiration in much of my entomological work.

UROCERUS FLAVICORNIS, FABRICIUS.

This species, which is very similar to the European *Urocerous gigas* Linn., ranges over all parts of Canada. There are the following records of its occurrence, based for the most part upon the work of Bradley and Kirby. It is found from Siberia and Alaska, south along the Pacific Coast to British Columbia, Oregon and along the Rocky Mountains to Arizona and New Mexico, and even Mexico; is unknown from California, and in Colorado, Utah, Arizona and New Mexico is confined to high altitudes. The single record from Nebraska is undoubtedly based upon an individual carried into the State as a larva or pupa in lumber shipped from the Canadian or Hudsonian life zone. This is not different from the record from England upon which Stephens based his species, *bizonatus*. In the east this species extends south from Keewatin through Labrador, Newfoundland, Nova Scotia, Northern New York, New Hampshire and Massachusetts. Specimens have been reported from the Adirondacks, Ithaca, White Mountains, and a small male from Connecticut. Provancher records the species from Canada, presumably Quebec. In the central region it has been reported from Cape Krusenstern, Arctic Regions, Fort Churchill, Hudson Bay, St. Martin's Falls, Albany River and Mackenzie River. I am writing the above to bring the records of distribution together and to record a specimen received from Mr. F. Johansen, which was collected by the Rev. I. O. Stringer along the Mackenzie River in 1896. This specimen comes from the Royal Ontario Museum of Toronto.

ALEX. D. MACGILLVRAY.

In the Royal Ontario Museum there are specimens of *Urocerus flavcornis* also from Spruce Brook, Nfld.; Godbout, Que., and Edmonton, Alta. The specimens from the last-named locality were taken by Mr. F. S. Carr, the others by the writer. The species was apparently common at Godbout, on the north shore of the lower St. Lawrence, near the Gulf.

E. M. WALKER.

Mailed eptember 1st, 1920.

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POPULAR AND PRACTICAL ENTOMOLOGY.

SOME WINTER INSECT LIFE.

BY RALPH HOPPING,
Vernon, B. C.

The cabin was a ranger station in the foothills of the Sierras, five miles from a small town called Dunlop, in Fresno County, California. In August the hillside close to the northern side of the cabin was dry, the grass was yellow, and even the brush a few rods away had a parched look. No insect life stirred in the dry, hot atmosphere. The winter rains, however, changed all this. By February everything was transformed. The hillside close to the cabin was green and numerous flowers were beginning to bloom everywhere. A great many insect holes appeared among the grass stems. These were of various shapes and sizes. The ranger, who was also an entomologist, was curious. So one Sunday, assisted by his deputy, an investigation began. Ant hills were common. The unknown possesses a lure much greater than the known. We merely noted that two species had homes on the hillside. Four other varieties of freshly-made holes invited our attention. Two were about three-eighths of an inch across with ant-like mounds around the entrance. The earth pellets, however, were of two kinds, one fine and granular, the other conglomerate, irregular masses composed of twelve to twenty grains of earth. The former proved to be a spider. Spiders are "common" to a coleopterist. We were not interested. The latter type of hole, however, produced a female *Bradycinetus horni*, Rivers. The next hole produced a male. Once we found the male and female in the same hole. In all we collected thirty-two specimens in holes of varying depths of from six to twelve inches. This is a rare species. We almost forgot the other holes, one of which was a horizontal slit in the hillside about three-eighths of an inch high and one and a fourth to one and a half inches in length. On the lower edge extended the "dump" of fine particles of earth, much like that at the mouth of a mining tunnel. These slits were not few. They existed in hundreds. Exploring the mountainside in all directions gave the same result. They were everywhere. The burrows extended horizontally an inch or two, and then perpendicularly for about eight inches. We explored half a dozen and each gave up a nice, fat blue-black scorpion. Thousands in our dooryard and we had lived there two years and had not seen them! We still had one other variety of hole. This was larger than any we had explored, about an inch across. One to one and a half inches below the surface the hole was plugged with earth. This plug was one to two inches thick. Below was an opening, a hole somewhat larger in diameter than the portion above the plug. We followed the hole down twenty-eight inches and found a round, fat, female *Pleocoma fimbriata*, Lec. She was reddish in colour, shiny, and lay on her back feebly waving her legs. That day we dug twenty-four from a varying

depth of eighteen to thirty inches. Always these holes were in the red soil. Suddenly I realized why I found so many holes in this red soil dug by foxes: "Mrs. Pleocoma" undoubtedly made a fine part of "Mr. Fox's" meal.

Many times I had caught the males of this species, a black, shiny beetle about one-half the size of the female, flying in the dusk during a slight drizzle. The females seldom if ever come out of the ground, the males only during the winter months or wet season. At such times the air was full of them, appearing like swarms of bees. But let the drizzle stop or let it actually begin to rain and, presto! they were gone. They only fly in the winter months after the first few soaking rains. This general habit of flying only in the winter and during a fine drizzle at dusk is common not only to *Pleocoma fimbriata* but to *Pleocoma behrensii*, Lec. and to *Pleocoma hoppingi* Fall, and probably to all the Pleocomas.

The underground life is all around us, but few of us know anything about it. We have eyes but we do not see.

ALBERTAN COLEOPTERA.

BY F. S. CARR,
Edmonton, Alberta.

Cicindela repanda edmontonensis, new variety.

Type to be deposited in the National Collection at Ottawa, labeled Edmonton, Alta. 21—VIII—19; F. S. Carr, collector; female.

Length 12.75 mm. The colour is dark brown with narrow elytral markings; the humeral and apical lunules are widely separated from the side margin, the dot of the oblique line being broken off that line. The humeral angles of the thorax are cupreous and the sulci blue, the blue fading out where the sulci join the median line. The under surface of the thorax is bright cupreous and of the abdomen shining green, the under surface being covered with long white pubescence.

The head is much narrower than the thorax, coarsely strigose, and with the front sparsely hairy. The elytra are punctate, each puncture having a shining granule.

This variety is another in that complex centering about *repanda* Dej., a complex characterized by a development of colour pattern along two directions. In one the elytral markings become heavier and more crowded, producing *bucolica* Csy. and *unijuncta* Csy.; in the other the markings become fainter, producing *edmontonensis* Carr and *hudsonica* Csy. All five varieties have been taken on the banks of the Saskatchewan River at Edmonton, *bucolica* and *unijuncta* being the most abundant.

Diplochila undulata, new species.

Type to be deposited in the National Collection at Ottawa, labeled 10-V-19, Edmonton, Alta.; collected by F. S. Carr; male.

The head is black, the palpi and antennæ piceous, the palpi being testaceous at the ends. The thorax is much wider than long, wider at the base than at the apex, widest at the anterior third. The posterior angles are obtuse, the basal impressions single, deep, linear, the median impression defined medially but obsolete anteriorly and posteriorly. The thorax is smooth. The elytra

are the same width at the base as the thorax, then widen out to the anterior sixth, then run parallel to the posterior fourth, from which the sides curve to the suture, the apex being sinuate. The intervals are interrupted by shallow transverse wrinkles most deeply incised where the intervals dip to the striæ; the striæ possess traces of punctures at rare intervals; the seventh stria is almost obsolete.

Length 13 mm.

This species is described from a series of six specimens all taken at Edmonton. The writer had for comparison a series of *obtusa* Lec., one from Edmonton and three from Mr. Chagnon, Montreal. From *obtusa* it is easily distinguished by its size and the appearance of the elytra, which somewhat resemble those of *Amara interstitialis* Dej.

Chlaenius frostii, new species.

The type is to be deposited in the National Collection at Ottawa, labeled 11–V–18, Edmonton, Alta.; collected by F. S. Carr; male.

Length 9 mm. The colour is black beneath, slightly violaceous above, darker on the head and thorax, polished and shining. The antennæ are piceous with the first joint pale, the palpi are black with the tip almost white, the terminal joint being dilated and truncate. The labial palpi are more dilated than the maxillary palpi. The head is smooth. The thorax is widest at the base gradually becoming narrower towards the apex, the base of the thorax and the elytra being the same width. The anterior angles are broadly rounded, the posterior obtuse. The impressions are double, wide, shallow and punctured coarsely, the punctures being separated by their own diameter. The median impression is defined as a narrow impressed line fading out anteriorly and posteriorly and bordered on each side by a row of punctures. The remainder of the surface is sparsely punctured with the exception of the base, which is punctured like the impressions.

The basal line of the elytra meets the lateral line at an angle. The striæ are clearly impressed and punctured and are wide apart, the intervals being flat and shining. The punctures of the intervals are coarse, being about 3½ punctures to the greatest width of any interval, and occurring in lines arranged more or less transversely. The punctures on the first interval are at most in two rows. The scutellar stria is short and deeply impressed. The abdomen is coarsely, shallowly and sparsely punctate and sparsely pubescent with short, yellow pubescence. The prosternum is coarsely and sparsely punctate; the mesosternal episternum and the metasternum are cribrate.

The describer has given this species the name *frostii* as an indication that he appreciates the great amount of assistance given him by Mr. C. A. Frost. In connection with this species Mr. Frost kindly loaned a specimen of *purpuricollis* Rand, that had been compared with the material in the Leconte and Harris collections.

This species is most closely related to *purpuricollis*. It is most readily distinguished by the following table:

frostii	*purpuricollis*
elytra shining	elytra opaque from small, transverse lines.
punctures coarse	punctures small

This species is described from a series of five, all taken in the Edmonton district.

Elleschus borealis, new species.

The type will be deposited in the National Collection at Ottawa. It is labeled 24–V–19; Edmonton, Alta.; collected by F. S. Carr.

Length 2.8 mm. The colour is red, the eyes alone being black, and is covered with white pubescence except for a denuded area behind the middle, stretching from the second interval to the margin and back to the top of the declivity. The beak is shining, shorter than the head and thorax, punctate, the punctures being coarse and well separated; the second joint of the antennæ is longer than the third, the median line on the thorax is raised in the middle only, the pubescence diverging from it to the sides, which are rounded. It is widest at the anterior third. The elytral striæ are finely impressed and punctate with coarse punctures closely placed.

This species seems to be closely allied to *bipunctatus* Linn., but is distinguished by its colour. It has been described from a large series taken on willow.

ADDENDUM.

Mr. F. A. Sherriff has kindly sent a specimen of *Chlaenius purpuricollis* Rand. This was received since the descriptions were prepared. It agrees with the specimen loaned by Mr. Frost. This specimen was also taken in Mass.

A BIBLIOGRAPHY OF THE LITERATURE ON THE DESCRIBED TRANSFORMATIONS AND FOOD PLANTS OF NORTH AMERICA SPECIES OF AGRILUS (COL.).

BY C. A. FROST AND H. B. WEISS.
New Brunswick, N. J.

(Continued from page 210.)

A. politus Say.

Blatchley, Col. Ind. p. 801, 1910.
Chittenden, Bul 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.
Childs, Mo. Bul. Cal. Hort. Comm., Vol III, pp. 150–155, 1914.
Felt, N. Y. St. Mus. Bul. 200, p. 37, 135, 1917.
Frost, Can. Ent., Nov., p. 386, 1916.
Hamilton, Tr. Am. Ent. Soc., Vol. XXII, p. 364, 1895.
Hopkins, Bul. 32, W. Va. Agric. Exp. Sta., p. 184.
Knull, Ent. News, Vol. XXXI, p. 10, 1920.
Lugger, Psyche, Vol. IV, p. 203, 1884.
Manee, Ent. News, Vol. XXIV, pp. 167–171, 1913.
Smith, Ins. N. J., p. 295, 1909.

This species is known as the oak twig-girdler. Spiral shaped burrows are made in the soft-growing tissues of the twig, and encircle it from four to seven times (Childs). Infests green bark on living willow trees (Hopkins). Common on *Salix obtusifolia* (Hamilton). On willow (Manee) (Blanchard). On hazel (Bruner). On *Salix* and *Corylus americana* and *C. rostrata* leaves (Frost). On oak and willow (Blatchley) (Smith). Breeds in living willow and striped maple (*Acer pennsylvanicum*) (Knull). Forms galls on twigs of white thorn (*Cratægus*) (Felt).

A. burkei Fisher.

Fisher, Can. Ent., Vol. 49, p. 287, 1917.

Larva mines inner bark and wood of normal, injured and dying white alder (*Alnus rhombifolia*) and paper-leaf alder (*A. tenuifolia*) (Fisher).

A. viridis L. var. **fagi** Ratz.

Weiss, Jour. Econ. Ent., Vol. VII, p. 438, 1914.

Weiss, Ent. News, Vol. XXVII, p. 426.

The larva of this species works in the stems of roses, making a spiral band of channels and causing a swelling or gall over the infested part. Theobald states that *viridis* attacks beech, alder, birch, aspen, oak.

A. sinuatus Oliv.

Banks, U. S. D. A., Div. Ent., Bul. 34, n. s., 1902.
Beach, Lowe, Stewart, Bull. 170, N. Y. Agric. Exp. Sta., pp. 381–445, 1899.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.
Felt, Proc. 24th An. Meet. Soc. Prom. Agric. Sci., pp. 39–48, 1903.
" 31st Ann. Rept. St. Ent. N. Y., p. 78, 1915.
" Bul. 200, N. Y. St. Mus., p. 134, 1917.
Howard, Ins. Life, Vol. VII, pp. 258–260, 1894.
Lugger, Bull. 66, Minn. Agric. Exp. Sta., pp. 85–331, 1899.
Parrott & Glasgow, N. Y. Sta. Circ. 44, 1915.
Slingerland & Crosby, Man. Fr. Ins., p. 230, 1914.
Smith, Ins. Life, Vol. VII, p. 189.
" Ins. Life, Vol. VII, pp. 258–260.
" Garden & Forest, pp. 373–374, 1894.
" Garden & Forest, p. 448, 1894.
" 15th Ann. Rept. N. J. Agric. Exp. Sta., pp. 423–600, 1894.
" Amer. Agric. 26, Jan., p. 85, 1895.
" Bul. 109 N. J. Agric. Exp. Sta., 1895.
" An. Rept. N. J. Agric. Exp. Sta., pp. 365–526, 1895.
" N. J. Ent. Rept., 1900.
" N. J. Exp. Sta. Bul. 155, 1902.
" N. J. Ent. Rept., 1901.
" Ins. N. J., p. 295, 1909.
" N. J. Ent. Circ., 28.
" N. J. Bd. Agr. Rept. 37, p. 188, 1910.
Webster, Bul. 77, Ohio Agric. Exp. Sta., pp. 33–52, 1897.
Weiss, Jour. Econ. Ent., Vol. VII, p. 251, 1914.
" N. J. Dept. Agr. Circ. 24, p. 5, 1918.

This species is the sinuate pear borer. Eggs are deposited in crevices and under flakes of bark, and the resulting slender, whitish larvæ construct narrow winding burrows in the sap wood, the courses of these channels being indicated exteriorly by the discoloured and abnormal bark over them. On young trees this discoloured bark splits or raises into a welt.

A. fallax Say.

Blatchley, Col. Ind., p. 802, 1910.
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

Hopkins, Bul. 32, W. Va. Agric. Exp. Sta., p. 184.
Knull, Ent. News, Vol. XXXI, p. 10, 1920.
Stromberg, Can. Ent., Vol. XXVI, p. 36.

Occurs on locust and oak (Blatchley). Adults reared from dead branches of honey locust (*G. triacanthos*) (Kirk). Beaten from oak (Stromberg). Habits similar to those of *egenus* (Chittenden). Infests bark and wood of dying branches of hackberry (*Celtis occidentalis*) (Hopkins). 'Reared from honey locust (Fisher).

A. crataegi Frost.

Frost, Can. Ent., Vol. XLIV, p. 247, 1912.

Bred from dead, fallen, trunk of *Crataegus* (Fisher & Kirk). Beaten from *Cratægus* (Liljeblad).

A. obsoletoguttatus Gory.

Blanchard, Ent. Amer., Vol. IV, p. 32 (*interruptus*).
Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900 (*interruptus*).
Harrington, 27th Rept. Ent. Soc. Ont., p. 71, 1896 (*interruptus*).
Knull, Ent. News, Vol. XXXI, p. 10, 1920.
Stromberg, Can. Ent., Vol. XXVI, p. 36.

Reared from dead branches of beech (*Fagus americana*), blue beech (*Carpinus caroliniana*), ironwood (*Ostrya virginiana*), red oak (*Quercus rubra*), and hickory (Knull). Probably breeds in oak (Blanchard). On oak (Chittenden). Found on beech, birch and hickory (Harrington). On red and laurel oaks (Stromberg). On red oak leaves (Frost). On dead beech (Morris).

A. scitulus Horn.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Reared from huisache (Schwarz).

A. ornatulus Horn.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Breeds in huisache (*Acacia farnesiana*) (Schwarz).

A. subcinctus Gory.

Knull, Ent. News, Vol. XXXI, p. 11, 1920.

On poison ivy (*Rhus toxicodendron*) (Wenzel).

A. abstersus Horn.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

Reared from twigs of *Acacia greggii* (Hubbard & Schwarz).

A. lecontei Saund.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.
Knull, Ent. News, Vol. XXXI, p. 11, 1920.
Lugger, Psyche, Vol. IV, p. 203, 1884.
Stromberg, Can. Ent., Vol. XXVI, p. 36.

Breeds in dead wood of hackberry (*Celtis occidentalis*) (Knull). On hackberry (Chittenden), (Schwarz), (Stromberg).

A. abductus Horn.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

On *Quercus arizonica* (Hubbard & Schwarz).

A. palmacollis Horn.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Reared from twigs and branches of mesquite (*Prosopis juliflora*) and huisache (*Acacia farnesiana*) (Schwarz).

A. felix Horn.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

Reared from *Parkinsonia microphylla* (Hubbard & Schwarz).

A. impexus Horn.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Stromberg, Can. Ent., Vol. XXVI, p. 36.

Occurs on the two locusts *Gleditschia triacanthos* and *Robinia pseudacacia* (Stromberg).

A. floridanus Crotch.

Blatchley, Can. Ent., Vol. LI, p. 29, 1919.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

On *Quercus* (Schwarz). Swept from huckleberry and other low shrubs (Blatchley).

A. addendus Crotch.

Blatchley, Col. Ind., p. 804, 1910.

Taken from peach trees in blossom (Blatchley).

A. lacustris Lec.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900 (*cuneus*).

Bred from *Croton capitatum;* also occurs on *Croton eleagnifolium* (Schwarz).

A. imbellis Crotch.

Blanchard, Ent. Amer., V, p. 32, 1889.

Chittenden, Bul. 22, n. s., U. S. D. A., Div. Ent., p. 68, 1900.

Occurs on *Helianthemum canadense* (Blanchard).

A. egenus Gory.

Blatchley, Col. Ind., p. 804, 1910.

Chittenden, Ent. Amer., Vol. V, pp. 217–220, 1889.

" Bull. 22, n. s., U. S. D. A., Div. Ent., p. 67, 1900.

Garman, Bien. Rept. St. For. Ky. 2, pp. 32–63, 1915.

" Bull. 200, Ky. Agric. Exp. Sta., p. 124, 1916.

Glover, Rept. U. S. Comm. Agric., pp. 65–91, 1870, 1871.

Hamilton, Trans. Am. Ent. Soc., Vol. XXII, p. 364, 1895.

Knull, Ent. News, Vol. XXXI, p. 11, 1920.

Packard, 5th Rept. U. S. Ent. Comm., p. 291, 1890.

" 5th Rept. U. S. Ent. Comm., p. 372, 1890.

Smith, Ins. N. J., p. 295, 1909.

This species infests locust mining under bark and twigs of smaller branches, the beetles eating the leaves. Reared from hickory (*Hicoria alba*) (Chittenden). Reared from *Robinia neomexicana* (Hubbard & Schwarz). On willow (Smith). Bred from Virginia creeper (Kirk). Garman states that the beetles have a singular way of chewing the edges of locust leaflets so as to give them a rough appearance, which however is so slight as to be easily overlooked. Knull states that *egenus* has been confused with *celti* in collections so that in view of this, some of the above records may apply to *celti*.

A. celti Knull.

Knull, Ent. News, Vol. XXXI, p. 11, 1920.

Reared from dead branches of hackberry (*Celtis occidentalis*) (Kirk & Knull).

NEW NEARCTIC CRANE-FLIES (TIPULIDÆ, DIPTERA). PART X.

BY CHARLES P. ALEXANDER,
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Ormosia frisoni, sp. n.

Closest to *O. meigenii* (O. S.); inner pleural appendage of the male hypopygium with a conspicuous lateral spine; all four gonapophyses of approximately equal size and shape.

Male.—Length 3–3.5 mm.; wing 4–4.5 mm.

Female.—Length 3.8–4 mm.; wing 4–4.8 mm.

Rostrum and palpi dark brown. Antennæ brownish black; flagellar segments oval, provided with a dense white pubescence and rather elongate verticils. Head yellowish grey.

Pronotum brown, the scutellum pale whitish yellow. Mesonotum uniformly brownish gray with a sparse yellowish bloom; pseudosutural foveæ conspicuously oval, black; tuberculate pits conspicuous, separated from one another by a distance a little greater than the diameter of one. Pleura light plumbeous. Halteres whitish. Legs with the coxæ plumbeous; trochanters light brown; femora brownish yellow, the tips broadly darkened; tibiæ and tarsi dark brown. Wings with a strong brownish gray tinge; stigma darker brown; conspicuous whitish areas before and beyond the stigma; basal cells largely whitish; veins dark brown. Venation: cell *1st* M_2 open by the atrophy of the outer deflection of M_3; anal veins convergent.

Abdomen dark brown, including the hypopygium. Male hypopygium with the inner pleural appendage smaller than the outer, before the tip with an acute black spine set at a right angle to the appendage; outer appendage strongly curved, the tip acute. Gonapophyses four in number, black, of approximately equal size and shape, the inner pair a little more slender than the outer pair; outer apophyses with a tiny tooth at about two-thirds the length on the inner face; inner apophyses with the basal half flattened, the distal half strongly narrowed; penis-guard slender, pale in colour. Ninth sternite with a spatulate lobe as in the group.

Habitat.—Illinois.

Holotype.—♂, Muncie, May 15, 1920, (Alexander).

Allotopotype.—♀, (Frison).

Paratopotypes.—1 ♂, May 8, 1920, (Frison); 32 ♂♀'s, May 15, 1920, (Alexander & Frison).

Type in the collection of the Illinois State Natural History Survey.

Ormosia frisoni bears a considerable resemblance to *O. meigenii* (O. S.) but is readily told by the smaller size, differently coloured wings and, especially, by the structure of the male hypopygium. In *O. meigenii* the inner pleural appendage has the tip narrowed into a chitinized point that is in a straight line with the axis of the appendage; of the four gonapophyses, the inner pair are approximately one-half longer than the outer pair. This interesting new species is dedicated to the collector, my friend, Mr. Theodore H. Frison.

This species occured near the margin of a prairie cat-tail swamp where it was associated with *Pseudolimnophila luteipennis* (O. S.) and *Tipula dejecta*

Walker. The flies were generally observed in small swarms among a dense growth of *Equisetum hiemale* that covered the embankment.

Ormosia notmani, sp. n.

General coloration dark brown, the praescutum without stripes; wings grayish subhyaline, the stigma slightly darker brown; cell *1st* M_2 open by the atrophy of the outer deflection of M_3; basal deflection of Cu_1 very oblique in position, inserted beyond the fork of *M*; *2nd Anal* vein bent toward the *1st Anal* on its outer end only; male hypopygium complicated; outer pleural appendage a black, three-spined structure; inner pleural appendage slender, deeply bifid; gonapophyses slender, the distal end slightly widened, each apophysis with a long, powerful spine at the base.

Male.—Length about 3.8 mm.; 4.4 mm.

Rostrum and palpi dark brown. Antennae slightly elongated, dark brown, the scapal segments a little paler; flagellar segments long-oval, provided with a dense, erect, white pubescence. Head brownish gray, provided with long, yellow bristles.

Pronotum brown, the scutellum obscure yellow. Mesonotum dark brown, sparsely dusted with a grayish yellow pollen; pseudosutural foveae conspicious, oval, black. Pleura brown, sparsely dusted with gray. Halteres light yellow. Legs with the coxæ and trochanters light yellow; femora light brown, brighter basally; remainder of the legs darker brown. Wings grayish subhyaline; stigma slightly darker, brown; wing-base a little brighter; veins dark brown. Venation: *r* less than its own length beyond the fork of R_{2+3} on R_2; cell *1st* M_2 open by the atrophy of the outer deflection of M_3; basal deflection of Cu_1 a short distance beyond the fork of *M*, very oblique in position, the branches of *Cu* forming an angle of about 100°; *2nd Anal* vein with the extreme outer end bent toward the *1st Anal*.

Abdomen dark brown, the hypopygium a little brighter. Male hypopygium somewhat as in *O. bilineata* Dietz and *O. subcornuta* Alexander but very distinct in the details of structure. Outer pleural appendage a short, squat, chitinized structure that terminates in three acute blackened points, the two outer ones short and sub-equal, the inner spine much longer, acute; inner pleural appendage long and slender, almost straight, profoundly bifid, the two arms lying generally parallel, the one arm appearing as a long, blackened spine with the proximal face microscopically serrulate, the other, more dorsal, arm slightly paler, sparsely setigerous. Gonapophyses shaped as slender blades, the outer ends a little flattened and expanded, at the base of each with a powerful, semi-erect spine that is about one-third the length of the apophysis. Ninth sternite with a conspicuous fleshy spatulate lobe as in the *meigenii* group of species.

Habitat.—New York.

Holotype.—♂, Keene Valley, Essex Co., May 26, 1920, (Notman).

Type in the collection of the author.

This remarkably distinct species is dedicated to the collector, Mr. Howard Notman, whose conscientious and capable efforts have added numerous species, in many orders, to the list of New York insects.

Limnophila (Eulimnophila) imbecilla illinoiensis, subsp. n.

Male.—Length 6 mm.; wing 6–6.5 mm.

Very similar to typical *imbecilla* Osten Sacken but very much smaller (in *imbecilla*, the wing of the male measures 8.2–8.5 mm.). Head yellowish with scarcely any gray pruinosity. Wings grayish yellow.

Habitat.—Illinois.

Holotype.—♂, Homer Park, June 13, 1920 (Frison).

Paratopotypes.—Two ♂'s.

Type in the collection of the Illinois State Natural History Survey.

Paratypes in the collection of Mr. Frison and the writer.

Tipula tennessa, sp. n.

Allied to *T. ultima* Alexander; wings brownish yellow, the dusky spot at the end of the vein *2nd A* small; abdominal tergites with a narrow, dark brown median line; male hypopygium with the ninth tergite small, the caudal margin with a broad, U-shaped median notch, the lateral lobes obtusely rounded with the margins smooth, on the ventral face with a sharp chitinized spine.

Male.—Length about 16.5 mm.; wing 18.5 mm.

Generally similar to *Tipula ultima*, differing as follows:

Antennæ with the basal flagellar segments distinctly bicolorous, the basal enlargement of each segment dark brown, the remainder of each segment paler yellowish brown, the distal flagellar segments more uniformly brown.

Coloration of the thorax identical in the two species. Wings with a deep, brownish yellow suffusion, as in *ultima*, the dusky spot at the tip of vein *2nd A* very restricted but evident. Venation: cell R_2 more acutely pointed at base; cell *1st* M_2 long and narrow; petiole of cell M_1 shorter than *m*.

Abdominal tergites dull yellow with a distinct but narrow median vitta of dark brown; lateral margins of the tergites less distinctly darkened; sternites yellow. Male hypopygium with the sclerites fused into a continuous ring as in *ultima*. Ninth tergite small, the caudal margin with a broad, U-shaped median notch, the lateral lobes thus formed broadly and obtusely rounded, their margins unarmed; on the ventral face of each of these lobes a conspicuous, chitinized spine directed ventrad and slightly caudad and proximad; on the middle line beneath a narrow chitinized ridge that is slightly bifid at the cephalic end. Inner pleural appendage small, flattened, the distal end curved into a spoon-shaped structure. Ninth sternite profoundly notched, at the base of the incision with a flattened, recurved lobe that is sparsely provided with short hairs; on either side of this rectangular lobe, a somewhat similar lobe whose inner or proximal margin is provided with numerous, long, yellow bristles that become more elongated near the distal end; from the base of each of these subtending lobes, a flattened digitiform lobe extends dorsad; from the region of the pleurite a similar lobe is found, lying parallel to the last, the notch between them very narrow.

Habitat.—Tennessee.

Holotype.—♂, Knoxville, May 17, 1915, (G. M. Bentley).

Type in the collection of the Department of Entomology, University of Tennessee.

It will be seen from the above characterization that the hypopygium is very

distinct from that of *Tipula ultima*, where the ninth tergite is deeply notched, the lateral lobes very large, flattened, directed proximad and with the margins provided with numerous tiny chitinized denticles; all the other lobes and appendages of the hypopygium are much smaller and less complicated than in *T. ultima*. It should be noted that the present species is on the wing during May whereas *T. ultima* is a characteristic autumnal species.

Tipula lygropis, sp. n.

Allied to *T. occidentalis* Doane; general coloration dark yellowish gray, the mesonotal præscutum with four brownish gray stripes; wings with a very strong brown suffusion, the obliterative streak unusually broad and conspicuous; abdomen obscure brown; male hypopygium with the ninth tergite with a deep, V-shaped notch; eighth sternite with two submedian pencils of long yellow hairs.

Male.—Length about 20 mm.; wing 21 mm.

Frontal prolongation of head dark brown, still darker laterally; no evident nasus, only a tuft of long hairs at this point; palpi brown, the basal two segments lighter in colour. Antennæ dark brown, the scapal segments slightly paler brown. Head brownish gray, the occiput darker; the vertex with indistinct lines that are concentric from the occiput.

Mesonotal praescutum yellowish gray with four brownish gray stripes, the intermediate pair narrowly separated for most of their length by a line of the ground colour, the ends contiguous; scutum light gray, the lobes largely dark gray; scutellum pale yellowish gray with a capillary brown median line, the lateral portions dark; postnotum yellowish gray, the posterior margins darker. Pleura dull gray, more yellowish gray before the base of the halteres. Halteres dark brown, the base of the stem brighter. Legs with the coxæ dull gray, the outer face sparsely yellow pollinose; femora and tibiæ reddish brown, narrowly tipped with dark brown; tarsi brown. Wings with a very strong brownish tinge; cells *C* and *Sc* more yellowish brown; cells *M* and *Cu* adjoining vein *Cu* more yellowish; a conspicuous brown spot at the end of *Sc* and another including the stigma; a paler brown seam at the origin of *Rs*, along the cord and at the tip of vein Cu_2; a very conspicuous white obliterative streak extending from cell *C* across cells *1st* R_1, the end of *R*, the basal two-fifths of cell *1st* M_2, into the base of cell M_3. Venation: R_{2+4} shorter than the distal section of R_2; petiole of cell M_2 a little more than one-half of *m*.

Abdomen obscure brownish, the tergites very indistinctly trivittate with still darker brown, the distal segments more uniformly darkened; sternites brownish gray. Male hypopygium moderately large. Ninth tergite with a very deep V-shaped median notch that extends almost back to the eighth segment; the lateral lobes have the ventral edge produced into a flattened, chitinized blade, the tips running out into small, chitinized points. Ninth pleurite rather conspicuous, conical, the apex obtusely rounded but flattened; outer pleural appendage conspicuous, rather stout, dark brown, clothed with long, dark hairs. Ninth sternite with a profound notch that is narrowly margined with pale, from its dorsal proximal angle hang two long, pendulous lobes. Eighth sternite with a broad, U-shaped notch, on either side of the median line of the base of the notch, a pencil of very long yellow bristles; lateral lobes produced

proximad into very broad-based triangular lobes that are directed proximad, the proximal margin sparsely provided with bristles, the tip narrowed.

Habitat.—California.

Holotype.—♂, Santa Cruz Island, May 16, 1919, (E. P. Van Duzee).

Type in the collection of the California Academy of Sciences

Tipula pseudotruncorum, sp. n.

General coloration light gray; antennæ short, dark brown; head with a linear brown mark; mesonotal praescutum with five more or less distinct brown lines; a capillary brown median line extending from the suture to the base of the abdomen; wings pale brown, variegated with dark brown and subhyaline blotches; abdomen buffy brown, the tergum with three conspicuous dark brown longitudinal stripes.

Male.—Length 15 mm.; wing 16 mm.

Female.—Length 20 mm.; wing 17.5 mm.

Frontal prolongation of the head long and slender, light gray; palpi dark brown. Antennæ short, the first segment elongate, dusted with gray; second scapal segment brownish; flagellum black, the segments short with the basal swelling indistinct. Head light gray with a conspicuous elongate brown mark.

Mesonotal praescutum light gray, conspicuously marked with dark brown; median stripe light gray, split by a capillary brown line, the lateral margins of the stripe more broadly dark brown; all three of these lines are confluent before the suture; lateral praescutal stripes dark, the area between them and the median stripe infuscated; scutum light gray with two isolated grayish brown marks on each lobe; remainder of the mesonotum light gray, a capillary brown line extending from the suture to the base of the abdomen. Pleura light gray. Halteres brownish yellow, the knobs dark brown. Legs with the coxæ light gray; trochanters grayish brown; femora black, more reddish basally; remainder of the legs black. Wings brown; stigma dark brown; a small, dark brown spot at the origin of *Rs;* membrane conspicuously variegated with subhyaline areas, the more conspicuous situated before and beyond the stigma, immediately before the origin of *Rs;* a conspicuous white blotch at the base of cell *M* and another at about two-thirds the length of the cell; indistinct whitish areas in cells *Cu* and *1st A*. Venation: *Rs* long; cell *1st* M_2 long and narrow; petiole of cell M_1 shorter than *m*.

Abdomen with the first tergite light gray; remaining tergites buffy brown, with three broad dark brown stripes that are narrowly interrupted at the base and apex of each segment; lateral margins of the tergites broadly light gray; sternites dusted with gray. Male hypopygium rather large. Ninth tergite with a broad, U-shaped notch, the lateral lobes indistinct, obtusely rounded; deep median incision that extends back to beyond mid-length of the tergite, the margins being practically contiguous. Ninth pleurite complete; outer pleural appendage tumid, gradually narrowed to the apex. Ninth sternite with a deep V-shaped notch, the lateral angles produced proximad into fleshy lobes that are contiguous on the median line, at the tip with conspicuous long yellow hairs that largely fill the notch of the sternite. Eighth sternite with the lateral angles produced into slight tumid lobes, each tipped with a pencil of long, reddish bristles, decussate across the median line.

The allotype female is much paler throughout but presumably belongs to this species; the markings on the body as well as the wings are very pale but indicated.

Habitat.—Northwestern United States.

Holotype.—♂, Longmire Springs, Mt. Rainier, Washington, altitude 2,500 feet, July 18, 1919, (Dr. C. L. Fox.).

Allotype.—♀, Paradise Valley, Mt. Rainier, altitude 6,000–8,000 feet, August 5, 1919, (Dr. C. L. Fox.).

Paratypes.—Two ♂'s, Moscow, Idaho.

Type in the collection of the California Academy of Sciences.

Tipula pseudotruncorum bears a resemblance to the European *T. truncorum* Meigen, and was distributed under this name by Prof. Doane. What is apparently this same species has been recorded by Snodgrass (Trans. Am. Ent. Soc., Vol. 30, pp. 211, 212; 1904) as *T. truncorum*. A comparison with authentic specimens of *truncorum* received from my friend, Herr M. P. Riedel, shows that the two species are abundantly distinct.

NOTES ON THE COLEOPTERA WITH DESCRIPTIONS OF NEW SPECIES.

BY C. A. FROST.
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Cicindela spreta Lec. Several years ago I prepared a note on the capture of this form in Maine, but after some correspondence with the late Mr. Edward D. Harris it was laid aside. Further interesting facts regarding this much misunderstood insect were noted in his letters which should correct the impression given by several authors that it is closely related to *purpurea* Oliv. His father, T. W. Harris, some time prior to 1848, sent Dr. LeConte a specimen taken at Eastport, Maine, and which, according to Mr. Harris, is the unique type now in the LeConte collection at Cambridge, Mass., and bears his father's label.

The original description in the "Catalogue of the Geodephagous Coleoptera" (Ann. Lyc. Nat. Hist., 1848, p. 177) begins, "*Obscure nigro-aenea subviridescens*,—", and was probably made from the specimen in the LeConte collection, as it is a green insect of about the shade of those green forms of *purpurea* which sometimes pass for *spreta*, but having the complete *limbalis* markings. The figured *spreta* on the coloured plate XIII of the above work is a black insect, and it is referred to in the LeConte Revision of the Cicindelae of 1856 (Trans. Am. Phil. Soc. XI., p. 37) under *limbalis* (as a variety of *splendida*) as, "*Nigra. C. spreta* Lec. Ann. Lyc., 4, 177; tab. 13, fig. 7", and in a few lines below, "Eastport, Maine, Dr. Harris." In the Harris collection, Boston Museum of Natural History, is one specimen bearing an "Eastport, Me.," label and the manuscript number 1502, which is referred to in the Harris manuscript catalogue as, "*Cicindela Raiana* H. ms. *spreta* Lec. Ann. Lyc. N.Y. IV. 177. Eastport, Me., Dr. J. Ray, 1836." This is the specimen referred to by Mr. E. D. Harris in a letter to me as the "companion specimen" to the one in the LeConte collection. I examined this (Harris collection) specimen, which still bears the

old Harris label, and found it much darker than the type at Cambridge. It is an almost black insect with the faintest traces of green. It is marked like the type, and is almost exactly as the figure on Plate XIII of the work of 1848. Does it not seem probable that Dr. LeConte made the description from his green specimen, and in some way the figure was made from the black specimen of the Harris collection? This supposition will at least account for the dual colour rôle of *spreta*.

In correspondence with Dr. LeConte, T. W. Harris expressed the opinion that *spreta* was much nearer *limbalis* Klug. than *purpurea*, and that Dr. LeConte was in accord with him is shown by the Revision of 1856.

In 1900, Mr. E. D. Harris took a large series (about 100 specimens) of *limbalis* at Mt. Desert, Me., and, discovering several dark green ones among them, took one to Cambridge and placed it beside the type, and then to the Harris collection where he made a comparison with the "companion specimen." His conclusion was, "It is, to all intents, exactly the same thing. It is *limbalis*."

On June 24, 1909, I took a specimen of *spreta* at Monmouth, Me., in a sparsely wooded pasture on the west shore of Lake Cobbosseecontee. It has been placed beside the type and found to be the same in every respect. Another specimen from Wales, Me., June 15, 1909, is very much like Mt. Desert *limbalis*, with reddish-cupreous shading and silky lustre. A specimen from Monmouth, June 25, 1905, is nearly intermediate between the other two, being a more clear green at the base of elytra and becoming gradually cupreous towards the apex, but without definite silky lustre.

From the above we have sufficient proof that *spreta* Lec., a rather dark green insect (of about the shade of the green forms of *purpurea*) with *limbalis* markings, (humeral, post-humeral and ante-apical dots, sinuate median fasciæ, and apical lunules) is but a colour variation of *limbalis* Klug. as represented by the Mt. Desert specimens. Therefore, Dr. Walther Horn is in error in the Genera Insectorum in placing "*spreta* Lec., 1848" as a "senile form" and *spreta* Lec., 1856, as a "black form" of *purpurea* Oliv.

Cicindela hentzi Dej., var. **niveihamata**, n. var. This interesting variation was taken at the Middlesex Fells Reservation in a road near the shore of Spot Pond in the town of Stoneham, Mass., July 26, 1903. It was found somewhat remote from the usual haunts of the species, although they frequently scatter from the ledges to the neighboring roads. The markings of this unique are formed by the extension of the apical lunules along the margin, including the ante-apical marginal spots, to and joining with the obliquely transverse median fasciæ; the result is a broad marginal band with sinuate inner edge terminating in a hook at the middle of each elytron. The median ante-apical dot has almost vanished and the humeral lunule is represented by a small humeral dot and a very faint sub-humeral one. The markings resemble those of the posterior half of the elytra of *C. schauppi* with the transverse fasciæ more oblique. In order to stimulate ambition and anticipation among those collectors who delight in aberrant forms this handsome little insect is duly christened as above.

Pterostichus corusculus Lec. This species, which has hitherto been taken rarely along a railroad embankment through a swamp, was found in large numbers (over 100) under stones, logs and in debris along the shores of

the Charles River in Medfield, Mass., April 19, 1919. There had been a heavy rain which flooded the meadows where these little insects evidently abound, and drove them to shelter along the river bank.

Elaphrus olivaceus Lec. Two specimens of this pretty swamp-loving species were taken at Monterey, Mass., July 9, 1919, in a dark, forbidding wood through which ran a small brook between low and muddy banks at the spot where they occurred. *E. cicatricosus* was also present at this place which was partly covered with dead branches; these did not improve the conditions under which they were taken by the usual method of treading about in the mud and keeping a close watch of the surface for any moving object.

Coccidula occidentalis Horn. A specimen was given me by Mr. H. M. Parshley, who took it at Orono, Maine, May 31, 1914, by sweeping in a meadow. It is almost exactly like several specimens from Edmonton, Alberta, taken by Mr. F. S. Carr, who, as usual, generously shared his catch with me. These were taken June 14 and 26, 1917. One of the characters given by Dr. Horn in his description of the species (Trans. Am. Ent. Soc. XXII, p. 114) is the black colour of the first two segments of the abdomen, these being yellow at the sides in *lepida* Lec. There are traces of yellow at the sides of the second segment on some of the Alberta specimens, and the Maine specimen shows a larger yellow area there. The habitat of the species is given by Horn as Wyoming to Vancouver.

A number of specimens of *C. lepida* were taken along a swollen brook in the debris washed down by the spring draining of a cranberry bog in Sherborn, Mass., May 23, 1908, and May 16, 1909. They could not be found on following years nor have they been taken elsewhere. The discal spot of the elytra in some of these specimens shows a tendency toward the cordiform shape of *occidentalis*, but there is no indication of a sutural stripe connecting it with the scutellar spot as in that species.

Buprestis sulcicollis Lec. In the "Review of the Genus Buprestis in North America," by Nicolay and Weiss (Jour. N. Y. Ent. Soc., Vol. XXVI) there appears the statement, on the authority of Dr. E. C. VanDyke, that the type "is not a brassy green insect as claimed by Casey, but of a uniform dull, coppery brown with a very slight greenish reflection." As I have examined the unique type four times, and on the last three occasions with special reference to the colour, I feel justified in recording that the statement gives an erroneous impression. With a good light on the specimen, Col. Casey's remarks (Studies in the American Buprestidæ), which are practically a copy of the original description, are correct. On a dark day the green is not so much in evidence, but if the sun is shining it is really a brilliant insect. It is especially green on the head and thorax, while the punctures between the rugæ of the elytral intervals are almost a golden green at the sides, becoming darker on the disk; the whole under side of the specimen is a bright brassy green. The only parts that are not green are the elytral costæ and the smooth places of the pronotum, which are a very dark bronze with greenish reflections. The appearance of the type is that of a wholly verdigris-green insect in which the colour is as fully and completely developed as in the type of *Chrysobothris verdigripennis*, and

some specimens of *Dicerca tuberculata*. My single specimen of this species is a bronze colour very similar to the dark forms of *Buprestis striata*, and is probably very near to the form *lateralis* Casey. The costæ are a greenish black, and the punctures along the striæ are a bright green set in the bright coppery rugæ of the intervals; it lacks the greenish shading of the type on the under side.

Chrysobothris orono, n. sp. Size and form of *verdigripennis*. Black with the punctured areas of a grayish-green colour, beneath cupreous or bronzed with the prosternum, femora, and sutures of the abdomen greenish. Antennæ bright metallic green, last joint and the lobes of the preceding seven, black. Clypeus arcuately emarginate with sides rounded, front greenish, coarsely, densely punctured and pubescent with two small median callosities; eyes rather widely separated above.

Prothorax not quite twice as wide as long, slightly wider at base than at middle, briefly rounded and narrowed at apex, slightly sinuate at middle, and with a very small sinuation before the hind angles, which are rectangularly acute and not narrowed; median dorsal sulcus limited in front by strong angulate costæ, which broaden out at middle and disappear behind; a short sinuate callosity at middle on each side.

Elytra widest behind and sinuate in front of middle, more convex than *scabripennis*, sutural costæ entire from apex to basal fourth and more strongly elevated than any of the others which are indicated by flattened, smooth, black areas and lines, punctured areas not as well defined as in *scabripennis* and *verdigripennis*, basal foveæ less evident.

Abdomen with sparse, shallow punctures and indistinct callosities, last ventral body semicircularly emarginate, last dorsal coarsely, sparsely punctured with a small, indistinct notch; prosternum not lobed, very densely pubescent and punctate, sides with coarse, sparse punctures and broad, interlacing, smooth spaces, the dense white pubescence extends along the median line on to the metasternum gradually becoming more sparse; front femora with a strong, serrulate, acute tooth; tibiæ with a large apical dilatation nearly one-third the length of the tibia, sinuate at the distal end, rising in an arc and terminating rather abruptly without sinuation; front and middle tibiæ strongly arcuate, hind tibiæ straight.

Length 14.5 mm., width 6 mm. at apical third.

The unique type is a male from Orono, Maine, July 4, 1908, in my collection. The species is dedicated to the Indian chief Orono, from whom the town where it was taken is named.

The species most nearly resembles *verdigripennis* superficially, but is distinct by the dark antennal joints, the much different tibial dilatation, and the straight hind tibiæ. In the coloration of the dorsal surface and in the tibial dilatation it resembles *carinipennis*, but in no other respects. From *trinervia* it differs in the shape of the thorax, tibial dilatation, elytral sculpture, size and last dorsal segment of abdomen.

(To be continued.)

NEW SAW-FLIES FROM MAINE AND NEW YORK (HYMENOPTERA).

BY ALEX. D. MacGILLIVRAY.
University of Illinois, Urbana, Ill.

All the adults of the following species were reared from larvæ. They are published at this time in order that the names can be used with descriptions of the larvæ.

Pteronidea evanida, n. sp.—Female. Body black with the following parts rufous: supraclypeal area, clypeus, labrum, mandibles, occipital and vertical orbits, extending onto the caudal aspect of head, collar, femora, profemora and mesofemora more or less irregularly infuscated, protibiæ, mesotibiæ, protarsi, mesotarsi, abdomen on segments one to six; trochanters whitish; ocellar basin sharply marked with vertical walls, dorsal side of frontal crest three sided; supraclypeal area elevated; median fovea longer than broad, deep, prominent; clypeus faintly semicircularly emarginate; antennæ with third, fourth and fifth segments subequal; head, mesonotum, mesoscutellum, and mesopleuræ dull, finely setaceous; wings hyaline, veins including costa reddish, stigma darker, margined with rufous; saw-guides with dorsal margin straight, ventral margin strongly convex, oblique, prominent point at dorsal angle. Length 7 mm.

Male.—Male differs in having median fovea longer, legs and collar lighter in colour, and abdominal segments one to five and lateral portions of six rufous.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Subs. 119, 111, 134.

This species is near *fulvicrus* Prov., but the two species are distinguishable by the form of the median fovea.

Pteronidea edura, n. sp.—Female. Body black with the following parts whitish: supraclypeal area, clypeus, labrum, mandibles in part, mouth-parts, collar, tegulæ, and legs beyond the middle of the coxæ, except the distal half of metatibiæ and metatarsi; following parts rufous: edge of frontal crest, occipital and vertical orbits faintly, caudal portion of first abdominal segment, second to sixth segments entirely, and cephalic part of sixth segment; ocellar basin moderately distinct; frontal crest rounded, unbroken, three-sided on dorsal margin; median fovea distinct, long, wedge-shaped depression; clypeus broadly angularly emarginate; antennæ with third and fourth segments subequal, fourth segment longer than fifth; mesonotum dull, setaceous, mesoscutellum polished, mesopostscutellum densely punctulate; wings hyaline, dotted with numerous black spinulæ, veins black, proximal portion of costa paler; saw-guides with dorsal margin concave, ventral margin convex and converging toward dorsal margin, distal end bluntly pointed. Length 8 mm.

Habitat.—Ithaca, New York, H. Yuasa. No. 8.45(?)^{c}–1–1.

This species runs to *lombardæ* Marl., but is differently coloured from the female of that species.

Pteronidea effusa, n. sp. Female. Body black with the following parts yellowish white: supraclypeal area, clypeus, labrum, mandibles, mouth-parts, collar broadly, tegulæ, and legs beyond distal ends of coxæ, except infuscated distal half of metatibiæ and the black metatarsi; following parts rufous: frontal crest, occipital and vertical orbits, lateral third of lateral lobes of mesonotum indistinctly, and abdominal segments one to seven except small cephalic

margin of first segment, and mesal spots on caudal margin of sixth and seventh segments; ocellar basin deep, distinct; frontal crest prominent, unbroken, curved on dorsal margin; median fovea shallow, elongate oval; clypeus broadly, shallowly emarginate; head dull, sparsely setaceous; mesoscutellum polished, mesonotum dull, caudal margin of mesopostscutellum punctured with small calices; mesopleura polished; antennæ with third and fourth segments subequal, fourth segment distinctly longer than fifth; wings hyaline, spinulæ inconspicuous, rufous, veins and costa and stigma in great part rufous; saw-guides with dorsal margin concave, ventral margin convex, converging toward distal end. Length 8 mm.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Sub. 110.

This species is similar to *edura* MacG., but the form of the frontal crest will separate them.

Pteronidea effeta, n. sp.—Female. Body black with the following parts yellowish white: clypeus, labrum, supraclypeal area, mouth-parts, collar, tegulæ, caudal angles of lateral lobes of mesonotum, and legs beyond coxæ except distal half of metatibiæ and metatarsi; following parts rufous: caudal portion of first abdominal segment, segments two to six entirely, most of seventh, frontal crest, and occipital and vertical orbits; clypeus broadly deeply emarginate; supraclypeal area swollen; median fovea elongate, linear, comparatively deep; frontal crest distinct, slightly broken, dorsal margin curved; ocellar basin distinct, not deep, open around median ocellus; each side of lateral ocelli depressed; surface for most part polished; mesonotum including mesoscutellum and mesopostscutellum polished, roughened with distinct calices of minute setæ; antennæ with third segment slightly longer than fourth, fourth and fifth subequal; wings hyaline, veins and stigma and costa rufous; saw-guides robust, dorsal margin concave, ventral margin convex, distal portion oblique, bluntly pointed above. Length 10 mm.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Sub. 158.

This species runs to *populi* Marl., but the topography of the head will separate the two species.

Pteronidea emerita, n. sp.—Female. Body black with the following parts yellowish: labrum, clypeus, supraclypeal area, mandibles, mouth-parts, collar, tegulæ, and legs except distal three-fourths of metatibiæ and metatarsi; following parts rufous: frontal crest, occipital and vertical orbits, and abdominal segments one to six; clypeus broadly, shallowly emarginate; median fovea a large, slightly depressed, triangular area; frontal crest strong, narrow, unbroken, ocellar basin deep, open about median ocellus, strongly elevated above postocellar area; antennæ with third segment longer than fourth, and fourth distinctly longer than fifth; head and thorax polished, with numerous minute setæ, mesoscutellum bare, mesopostscutellum with caudal margin roughened; wings hyaline, veins and costa and stigma reddish; spinulæ point-like, black; saw-guides with straight dorsal margin, convex ventral margin, converging convex distal portion, blunt distal end. Length 9 mm.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Sub. 139.

This species is very similar in general appearance to *effeta* MacG.

Pteronidea erudita, n. sp.—Female. Body black with the following parts yellowish: labrum, clypeus, mandibles, supraclypeal area, collar, tegulæ,

lateral half of each lateral lobe of the mesonotum, and legs beyond middle of coxæ except distal third of metatibiæ and metatarsi; following parts rufous: frontal crest, occipital and vertical orbits, and abdominal segments two to seven; clypeus broadly, shallowly emarginate; median fovea elongate, shallow, furrow-like; frontal crest broken, high adjacent to meson, low on lateral portions, dorsal margin two sided; ocellar basin shallow, flat, open about median ocellus, hardly raised above postocellar area; antennæ with third, fourth, and fifth segments subequal; head and thorax polished, with closely-placed calices of fine setæ; mesopostscutellum roughened; wings hyaline, veins and costa and stigma reddish; saw-guides narrow, dorsal margin straight, ventral margin convex, distal portion straight and convergent, pointed. Length 7 mm.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Sub. 12.

This species is similar to *effeta* MacG. and *emerita* MacG. The colour of the mesonotum will distinguish them.

Pteronidea edita, n. sp.—Male. Body black with the following parts yellowish: clypeus, labrum, supraclypeal area, mandibles, genal orbits, pronotum broadly, tegulæ, legs except metacoxæ and distal end of metatibiæ and metatarsi, and caudal margin of abdominal terga and venter entirely; following parts rufous: occipital and vertical orbits broadly, frontal orbits narrowly; median fovea deep, broad, longer than broad; antennæ with third segment slightly longer than fourth and latter slightly longer than fifth; frontal crest obscure, broken; ocellar basin shallow, flat, lateral walls distinct but narrow and low; head and thorax dull with numerous subadjacent calices; mesopleura, particularly ventral portion, with numerous short, white setæ; caudal margin of last sternum angularly emarginate; wings hyaline, stigma with costal portion dark, remainder yellowish, costa yellowish, veins blackish. Length 6 mm.

Habitat.—Ithaca, New York. H. Yuasa. No. 5[1]–1–6.

This species runs to *ventralis* Say, but the difference in their coloration will differentiate them.

Pteronidea exacta, n. sp.—Male. Body black with the following parts white: labrum, clypeus, supraclypeal area, mandibles, mouth-parts, genal orbits, collar broadly, tegulæ, and legs except a fuscous ring on distal end of metatibiæ; following parts rufous: occipital and vertical orbits broadly, frontal orbits narrowly; clypeus roundly, shallowly emarginate; supraclypeal area not prominent; median fovea a small, rather deep pit; frontal crest fairly strong, unbroken, transverse, straight; ocellar basin shallow, lateral walls hardly elevated, surface flat, open between ocelli, and not as high as postocellar area; antennæ with third segment slightly longer than fourth, and fourth slightly longer than fifth; head and thorax setaceous; mesoscutellum polished, mesopostscutellum somewhat roughened; procidentia short, rounded, strongly convex; wings hyaline, veins and costa and stigma yellowish. Length 4.5 mm.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Sub. 172.

This species is similar to *dubia* Marl., but the length of the third antennal segment will separate them.

Pteronidea equina, n. sp.—Female. Body black with the following parts yellowish white: supraclypeal area, clypeus, labrum, mandibles, mouth-parts, genal and occipital and vertical orbits broadly, frontal orbits narrowly,

orbital markings more brownish than others, antennæ for most part, collar, tegulæ, mesopleuræ for most part, mesosternum, sides of mesoscutellum, legs except distal portion of metatibiæ and metatarsi, venter of abdomen entirely, caudal margin of abdominal terga, becoming successively broader on caudal terga, caudal tergum entirely, and saw-guides except tips; clypeus narrowly roundly, emarginate; median foveæ broad, round depression with sloping sides; frontal crest narrow, distinct, unbroken, dorsal margin two-sided; ocellar basin distinct, flat, lateral walls narrow, sharp, and distinct; postocellar area not depressed below ocellar basin; head and thorax setaceous; mesopostscutellum setaceous, not roughened; wings hyaline with numerous spinulæ, veins and stigma and costa yellowish; saw-guides with dorsal margin straight, ventral margin straight, distal portion oblique, convex, bluntly pointed above. Length 5.5 mm.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Sub. 71.

This species runs to *kincaidi* Marl. Its coloration is distinctive.

Pteronidea enavata, n. sp.—Female. Body rufous with the following parts black: small, transverse area surrounding ocelli, small spot on caudal margin of postocellar area, antennæ, mesal area of median lobe of mesonotum, mesopostscutellum in great part, metascutellum, ring on metatibiæ, and cephalic band, narrower on caudal segments, on abdominal terga; following parts whitish: labrum, pronotum, tegulæ, and legs in great part, except tarsi; clypeus broadly emarginate, almost truncate; median fovea pit-like, deep; frontal crest broken by oblong depression bearing median fovea, two-sides, angular; ocellar basin flat, roughened, limiting lateral walls narrow, not strongly raised; antennæ with third and fourth segments subequal, fifth shorter; head and thorax dull, setaceous; wings yellowish, veins and costa and stigma pale, spinulæ not prominent; saw-guides with dorsal margin straight, ventral margin convex, distal portion oblique, pointed at distal end above. Length 6 mm.

Habitat.—Orono, Maine. Maine Agricultural Experiment Station, Sub. 25.

This species resembles *pinguidorsum* Dyar, but they are easily separated by the difference in the form of the head ridges.

Pristiphora ostiaria, n. sp.—Female. Body black with the following parts white: labrum, mandible, mouth-parts, collar broadly, tegulæ, and legs except a spot on proximal end of metacoxæ, distal one-fourth of metafemora, distal one-third of metatibiæ, and metatarsi; antennæ with third segment longer than fourth, fourth and fifth subequal; clypeus truncate; median fovea an inconspicuous depression; frontal crest wanting; ocellar basin distinguishable, lateral walls not conspicuous; head uniformly finely punctured; occipital, ocellar, and interocellar furrows wanting; mesonotum including mesoscutellum and mesopostscutellum, polished; mesopleuræ with white setæ; wings hyaline, veins and stigma brownish, costa pale, spinulæ numerous; saw-guides narrow with dorsal margin straight, ventral margin convex, distal end oblique and blunt. Length 6 mm.

Male.—The male differs in having supraclypeal area, genal orbits, clypeus, and venter of abdomen pale; median fovea is larger and more conspicuous; procidentia is comparatively broad, flat, rounded. Length 5 mm.

Habitat.—Ithaca, New York. H. Yuasa. No. 212–1–1.

This species is near *banksi* Marl., but they can be separated by the difference in coloration.

NOTES ON GALERUCELLA NYMPHAEAE L., THE POND-LILY LEAF-BEETLE (COLEOP.)

BY HARRY B. WEISS AND ERDMAN WEST.
New Brunswick, N. J.

This species occurs throughout New Jersey on the yellow pond-lily (*Nymphaea advena* Ait.) which is common along the lower Delaware River and adjacent ditches and tide-water streams. During the seasons of 1919 and 1920, it was particularly abundant at Monmouth Junction, Westville and several other places in New Jersey, defacing the leaves and flowers and rendering them ragged and unsightly.

Blatchley[1] states that the adult probably hibernates and this appears likely as adults have been taken during the middle and last of May and early June. The yellow eggs are deposited on the upper surfaces of the leaves in clusters of 18 to 20, each egg being stuck on end to the leaf surface and close to its neighbor. MacGillivray[2] states that he found clusters containing as few as 6 eggs and gives the number as ranging from 6 to 20. These hatch in about a week, each larva emerging from the upper half of the egg and feeding takes place in colonies on the upper layers of the leaf tissue, resulting in irregular, unsightly, denuded areas. As the larvae become larger they separate and feed independently on either side of a leaf.

In the latitude of New Jersey, many become full-grown about the third week of June, pupation taking place on the upper or under leaf surface. This stage lasts about one week, the beetles appearing the last of June and first part of July. There are at least two generations in New Jersey. During the middle and last of June it is possible to find all stages of the insect except eggs.

Chittenden[3] records the adult as attacking plants belonging to botanical families not at all related to its normal food plants such as aquatic species of *Nymphaea*, *Sagittaria*, *Brasenia*, *Nuphar* and mentions basket willow and beans. He further states that it frequently has received mention under the name *Galeruca sagittariae* Gyll, and is evidently of foreign origin, being found abundantly in northern Europe, and Siberia. In this country it has been recorded from Texas, California, Oregon, Indiana and occurs from the Hudson Bay region southward to the District of Columbia and Virginia. It is, therefore, a well distributed species. Both Schaupp[4] and MacGillivray[5] have described the early stages and the latter's descriptions being the most detailed are given below together with additional material in brackets which it was thought desirable to add.

Egg.—(Length 0.9 mm. Width 0.5 mm.) "Oblong or short cylindric with smoothly, obtusely rounded ends; yellow, shining." (The surface is sculptured with hexagonal markings having depressed centres.)

Larva. (Length 7 to 8.5 mm. Width about 1.8 mm.). Head black; the antennae mere tubercles, three jointed; the labrum three-sided, the distal and lateral margins in the form of a continuous convex curve constituting one side, the remaining sides formed by the proximal end of the labrum with an angle

1. The Coleoptera of Indiana, p. 1169.
2. Bull. 68, N. Y. State Mus., 1903, pp. 325–326.
3. Bul. 54, U. S. D. A. Bur. Ent., p. 58, 1905.
4. Bul. Brook. Ent. Soc., Vol. VI, p. 54.
5. Loc. cit.

on the median line, the distal margin with a row of comb-like bristles attached to the ental surface, two long discal and two long lateral setae, the two groups forming a transverse line, and four marginal setae; the mandibles tridentate, the two inner teeth subsequal, the outer one much shorter; the thorax and abdomen black above except at the sutures and with fine whitish fuscous lines dividing the black into distinct areas—there is such a line on the meson of the notum of the three thoracic segments and a line on each abdominal segment dividing it into two parallel transverse bands, the posterior being the longer; at the end of each of these bands a subquadrangular spot, and laterad of each anterior spot another subsequal in size which bears the spiracle, and laterad of the spiracle a much larger spot as long as the width of the segment," (bearing two comparatively long hairs; the last abdominal segment bears a row of long fine hairs on the posterior edge and the dorsal black spots on this segment are fused.) "The sternum of the thorax and abdomen pale except a spot on either side of the thorax laterad of the legs and homodynamous spots on each abdominal segment (all of the foregoing spots bearing one or two hairs,) a spot on either side mesad of the spots just described (each abdominal spot bears a short hair,) and a median broad spot; and the last ventral abdominal segment with a well developed proleg, legs blackish except at the sutures." (In many specimens the lines dividing the segments are decidedly yellow giving the larva a banded appearance dorsally. In others these lines and the lines dividing the black areas are indistinct and the entire dorsal surface appears black. The ventral surface is usually yellowish and the median brownish to black spots vary in area.)

Pupa. "Length (5 to) 7 mm. Width, (2.6 to) 4 mm. Black except the sternum of the thorax and abdomen, the apical segment of the abdomen which is covered by the cast skin of the larva, the basal segments of the legs, and a median tergal line which are yellowish; the legs, wing-pads and antennae not closely joined to the body; the very young pupae are lighter (yellowish at first) in colour."

Adult. This was described by Linnaeus in 1758 (Syst. Nat. p. 376). The following redescription is by Blatchley[6].

"Oblong-oval, narrower in front, subdepressed. Piceous brown, finely pubescent; thorax dull yellow, usually with three piceous spots; side margin, apex and epipleura of elytra yellowish; under surface and antennae piceous, the basal joints of the latter partly dull yellow; legs pale. Thorax twice as wide as long, sides rather strongly angulate; front angles small, prominent, hind angles nearly obsolete; disk with median narrow depression and a larger one each side which is densely punctured and piceous; surface otherwise smooth or with a few coarse punctures. Elytra slightly broader behind, margins distinctly flattened, surface coarsely and rather closely punctate. Length 4.5-6 mm.

DeGeer as early as 1775 gave an account of this insect in *Memoires pour servir á l'historie des Insects*, vol. V, pp. 326-329, Pl. 10, figs. 1-6, and it has received attention since then from other foreign authors.

Chittenden[7] states that arsenicals are quite effective remedies in checking the beetle on willow and for aquatic plants suggests flooding together with a few drops of oil on the water to destroy the floating insects. If this is not possible

6. Loc. cit.
7. Loc. cit.

the arsenical could be applied to the infested plants either as a dust or as a spray. If applied as a spray, care should be taken not to use a pressure strong enough to submerge the pads. Plant parts well out of the water could be coated readily. It was noted that this insect was absent in areas where the pond-lilies were entirely covered by the tide each day.

A NEW GRACILARIA INJURIOUS TO AVOCADO (LEPID.).

BY AUGUST BUSCK, WASHINGTON, D.C.

Gracilaria perseæ, n. sp.

Labial and maxilary palpi ochreous shaded on the underside with black. Face light golden ochreous. Head and thorax purplish ochreous. Antennæ whitish with black annulations. Forewings light ochreous with a purplish sheen especially on dorsal half and apex; a few black scales on costa at basal fifth, a small black dot on costa near the middle, and a few scattered black scales at apical fifth seem to be constant in all the specimens before me; there are also a few scattered black scales on the dorsal margin and the extreme apex is slightly clouded with dark scales. Cilia very dark nearly black. Hind wings blackish fuscous with black cilia. Abdomen blackish fuscous above light golden yellow on the underside. Anterior tibæ thickened with blackish-brown scales; posterior coxæ and femora golden yellow with broad, black fasciæ; all tarsi white with extreme tip of each point touched with light brown.

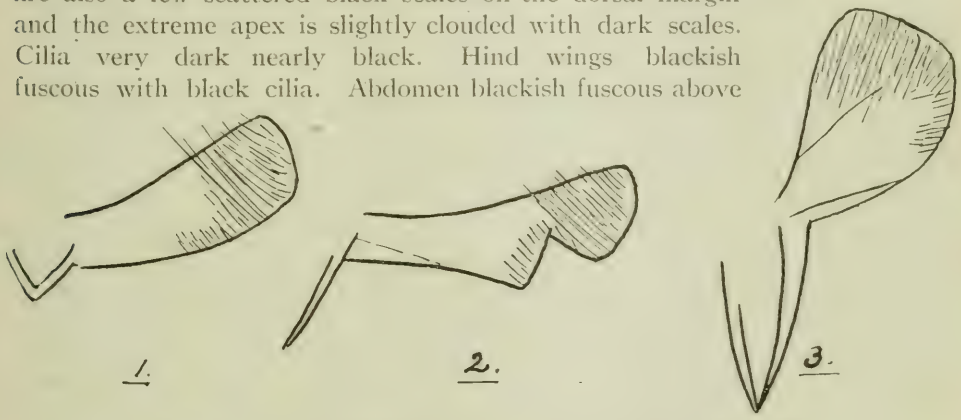


Fig. 22.—Harps of *Gracilaria perseæ* (1), *G. burserella* (2) and *G. violacella* (3).

Habitat.—Miami, Florida. U. S. N. M. Type No. 23515.

Bred from leaves of Avocado (Aquacate), *Persea persea*, at Miami, Florida, during July by Mr. G. F. Moznette, who states that the species is seriously destructive to the young growth. The larvæ are typical of the genus; they first make a small mine between the veins of the young leaves, and subsequently fold the tip or the sides of the leaf downwards. The cocoon is white, narrow, oblong, and is spun in a fold on the leaf.

The species is typical of the genus; in coloration it is similar to and intermediate between *G. violacella* Clemens and *G. burserella* Busck, but the male genitalia are so different in the three species as to indicate that they are not truly closely allied. The outline sketches of the harps suffice to separate the three species. The vinculum of *perseæ* is unusually short for the genus, and the harps are straight oar-shaped (Fig. 1), very different from the deeply-notched harps of *burserella* (Fig. 2), and the broadly-curved harps of *violacella* (Fig. 3); the last form is the more common in the genus.

BOOK REVIEW.

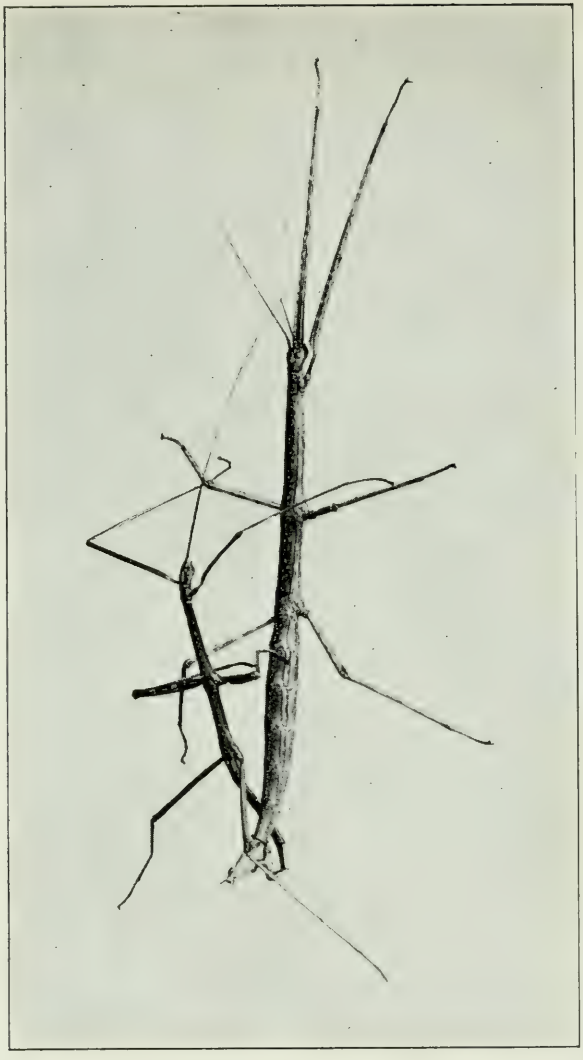
THE USE OF CARBON BISULPHIDE AGAINST THE WHITE GRUB. By W. H. W. Komp. Soil Science, Vol. X, No. 1, pp. 15–28. Miscellaneous Soil Insecticide Tests by J. J. Davis, Soil Science, Vol. X, No. 1, pp. 61–72, pls. 1, 2, 1920.

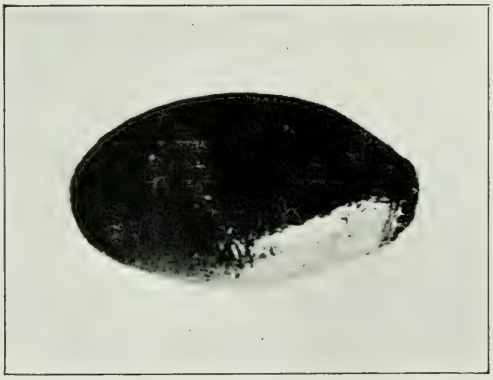
The above two papers, which are of entomological interest, have recently appeared in Soil Science, a journal devoted to soil physics, soil chemistry and soil biology. While they are clearly within the field of soil biology, it is doubtful if they will reach the eys of many entomological readers and, for such a reason, it was thought advisable to prepare this brief notice. Mr. Komp's paper deals with the determinations of the maximum dosage of carbon bisulphide noninjurious to such plants as blue-grass and clover, the minimum dosage fatal to the grub, and the influence of temperature and moisture conditions upon the effectiveness of the fumigation. Presumably, *Lachnosterna* larvæ were used. A detailed account of the experiments is given together with tables showing air and soil temperatures, dosages, effect of carbon bisulphide on plants and percentages of grub mortality, using different dosages at different depths and distances in the soil. Mr. Komp concludes that the maximum dosage for ordinary lawn and golf-grasses appears to lie somewhere between 1 and 5 ounces per square foot and considerably above the former, while the minimum dosage for the white grub is about 1 ounce, also that temperature exerts a decided influence on the minimum dosage for the white grub (1 oz. at 65 degrees F. and less than 1 oz. at 85 degrees or above). The injections should not be much over six inches apart. The soil moisture must be medium (10%) to wet (20%) for good results. In addition the charge of carbon bisulphide should be placed several inches below the point where the grubs are working. A limiting factor in the use of carbon bisulphide against the white grub in situations in which it cannot be reached by cultural methods is its relatively high cost. According to the tables in Mr. Komp's paper, the number of larvæ used in a single experiment varied from 2 to 4, and the mortality figures or percentages are based on these numbers. These appear to be far too small to insure any degree of certainty in the results.

The second paper by Mr. Davis reviews briefly the results obtained by various workers using such soil insecticides as carbon bisulphide, sodium cyanide, potassium cyanide, hydrocyanic acid, calcium cyanamide and kerosene emulsion against various soil infesting insects. In addition, he gives the results of his own field tests with such materials as kerosene emulsion, creosote preparations, corrosive sublimate, sulphuric acid, acetaldehyde, Kopper's solution, and especially sodium cyanide against the grubs of *Popilia japonica*. Tables are presented showing rates of application per acre, areas treated, areas examined, dates of treatment and percentages of mortality. After summarizing the present knowledge of the effect of treatments of cyanide and of cyanide in combination with ammonium sulphate on soil, Mr. Davis concludes that while many isolated experiments have been made to determine the possible use of sodium cyanide as a soil insecticide, the entire study lacks continuity, and that until a consistent and continuous program of work is inaugurated, very little in the way of definite results can be expected.

October, 1920 HARRY B. WEISS, New Brunswick, New Jersey.

Mailed October 30th, 1920





Diapheromera femorata Say.—Pair in copula (natural size) and egg (greatly enlarged).

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POPULAR AND PRACTICAL ENTOMOLOGY.

WALKING STICKS.

BY C. B. HUTCHINGS,
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Walking Sticks belong to the Order of Orthoptera and are classed under the family Phasmidae, the members of which present a great variety of form. It may be said without exaggeration that the Phasmids exhibit some of the most peculiar, curious objects to be found anywhere in natural history. Among this strange group of insects are those that resemble leaves of trees, lichen-covered bark, stems of grasses and sticks; and so faithfully are these protective characteristics portrayed that an observer may readily be deceived by them even when actually aware of the presence of the insect. It may be worthy of passing notice to mention here that to the Phasmids belong some of the largest insects known. In the Tropics, where both sexes develop wings they attain their greatest size, six inches being a common length.

The particular species to which this paper refers is popularly known by a variety of names such as "stick insect," "stick bug," "specter," "prairie alligator," "devil's horse," "devil's darning needle," etc ; the correct name, however, is the thick-thighed walking stick, an appropriate one given by reason of the remarkably dilated femora.

It was during the summer of 1918, while engaged on an oak-borer problem in Queen's Park, Aylmer, Que., ten miles northwest of Ottawa City, that the writer came upon a number of thick-thighed walking sticks, (*Diapheromera femorata* Say), defoliating oak, basswood and hazel. Several specimens were collected for the purpose of making a closer study of the life-history of these extraordinary insects and of obtaining notes on egg records, feeding, general habits and other biologic data. Observations were continued during 1919, and the results of the two seasons work are briefly recorded in this paper.

Ecology. The particular locality where most of the collecting was done was in a thickly wooded lot covered with a mixed growth, for the most part red oaks, but also containing a considerable proportion of maple, ash, basswood, hazel, hickory, ironwood, beech, elm, service-berry and large numbers of sumach and hawthorn. Here small, green, young nymphs of the walking stick were often to be found during June wandering about on the ground over dead leaves and mosses, trying to locate some convenient twig or trunk of a suitable host plant to crawl upon; or, what was more frequent, would be seen on the trunks of the oaks, awkwardly and lazily plodding their way upwards over the roughened bark to the tender, green leaves above, where not only abundant food awaited them, but also excellent protection from enemies was afforded by means of their deceptive colouration. Searching carefully under the large basswood leaves, and by moving quietly among the under growth many specimens of half-grown nymphs

could be located clinging to the twigs and branches, their presence not always being detected at first sight on account of the odd similarity of their long thin bodies and legs to the twigs and branches they were on, a protective resemblance of quite a remarkable character. When disturbed they would often drop suddenly to earth or nervously jerk themselves this way and that; if irritated they exhibited a queer habit of swaying or rolling from side to side, cradle-fashion. Both sexes were taken, but females proved more abundant. Several pairs *in copula* were observed on oak later in the season during August and September.

Egg. This exceedingly odd and interesting object may readily be mistaken for a seed of some kind. In fact one may favourably compare it with that of hemp, so closely does it resemble this product of the vegetable kingdom both in size and shape. It is for the most part black in colour, and highly polished, with a dull whitish keel, shading to olive tints; oval in shape, flattened slightly on the sides and quite hard. At one end is the operculum or capsule, a circular cover which is dark amber in colour, deeply wrinkled and surrounded with a crown of spines, below which a dark oval ring is arranged somewhat obliquely. An oblong scar appears on the whitened area, which is very much like the hilum of a bean.

Nymph. The young nymph is bright green in colour, slow-moving and very awkward. When first hatched the body is about 5/16 of an inch long, and is of a yellow-green cast; legs and antennae are prominently long and eyes noticeably dark brown. It often happens that some difficulty is experienced in emerging from the egg, and it is not an uncommon sight to find the egg shell attached to one of the hind tarsi being dragged about by the young stick. This may be due to a lack of moisture, for if a drop of water is placed on the shell the creature soon extricates itself. The swaying or rocking habit is very marked in the youngest of nymphs, even those of one day old. As the adult stages are approached, the green tints become tinged with yellow, these again take on a darker shading and tone down to grey-greens, dull-reds, mottled-browns, and dark-greys.

Adults. Generally speaking these insects are long, slim, very narrow, and stick-like in shape. The female is much longer than the male and measures on an average from 3¼ inches to 3½ inches in length, and not more than 3/16 inch broad at the widest part of the abdomen. The head is short and truncate, fits closely to the thorax and at first sight appears to be part of same. The antennae are situated well in front of the eyes and stand upon strong pedestals which are placed widely apart on the head: they are very fine, thread-like organs, of many segments and very long, often exceeding 2 inches; the eyes are large, bulging and strongly rounded; the palpi long, prominent, and conspicuously used while feeding. Not only does the female differ from her mate in length, but her front legs are more dilated, the ridges and grooves on these being more distinctly and deeply marked; the peculiar curve at the base of the front femora which permits the legs to fit very closely to the head is more pronounced than in the male; the middle femora are not swollen as is certainly the case in the male, and the spurs carried on the femora of the second and third pairs of legs are small, insignificant points when compared with those of the male's which are very prominent, sharp and thorn-like, situated near the knee joint. In the female the head and legs are without markings, whereas the male has three

vertical dark-brown stripes on his head and three broad bands of the same colour on the middle femora. Perhaps the thorax is worthy of more than usual attention on account of its extraordinary length. The prothorax, or first division, is very short and bears the first pair of legs which come off from the centre; the second division, or mesothorax, is easily the longest segment in the body, averaging $^3/_4$ inch; while the third, or metathorax, is a little shorter than the second, in the last two cases the legs being situated at the very extremity of the joints, respectively. The final segment of the male terminates in a pair of pincer-like claspers with which he seizes the female securely when mating.

Copulating habits. Copulation occurs frequently and is often of some duration. *In coitu* the abdomen of the male is ranged at the side of the female in a slanting position, the tip being hooked upward somewhat after the manner in which a scorpion carries its tail, and brought forward to meet the genital opening of the female which is situated on the eighth segment of the abdomen: the claspers seize just above the opening and the union is made immediately. The front and middle pairs of legs are usually employed to grasp the female, while the third pair is extended outwards as a support. The female holds to her resting place chiefly by the second and third pairs of legs. Sometimes one of the front legs will act as a support, say on the side of the cage, while the other hangs out into space. The front pair, however, is often extended straight forward and placed close together appearing as only one member, or spread out widely apart and raised somewhat upwards in much the same attitude as that of the praying mantis, a near relative of the walking stick. Oviposition begins at once.

Oviposition. This occurs in late summer and autumn, from about the middle of August to October. The female walking stick has no interest whatever in her eggs after she has laid them. She scatters them indescriminately from wherever she happens to be, dropping them from the topmost branches of some oak or from a low coppice to the earth—it is all the same to her,—she has finished with them entirely and neither knows nor cares afterwards what becomes of them. On the ground the majority get covered up in the long grasses or become hidden among the dead leaves, mosses and general debris of the woods at autumn time in this way they receive protection from birds and other enemies until hatching in June.

Oviposition is an interesting performance. When ready to be deposited the egg is slowly pushed down the oviducts to the exterior and as it emerges the egg guides are forced downward to receive it. It glides on to these and is held there as if in a hand, being supported on either side by two finger-like processes. The black and shiny portion lies at the top of the guides and the whitened area with its crease and scar at the bottom. The operculum end appears last. The egg is held about 5 minutes on the guides and when dry the female stirs by walking a step or two, or vigorously jerks her abdomen sideways, sending the egg from her to the ground. From laboratory records this summer, the two females I had confined in cages laid respectively 152 and 141 eggs, at an average rate of three a day. Oviposition was carried on intermittently with copulation, eggs being laid up to within a few hours of the death of the female. Perhaps one of the strangest habits peculiar to some of the females at this time,

when oviposition is at an end, is the withering and splitting of the abdomen much the same as a bean pod will dry, curl and split open.

Females in the late fall may be found in this unfortunate spent condition with strength only left to drag themselves about awhile longer. Some specimens in our collection exemplify this most extraordinary characteristic.

Time of Hatching. Although abundant during 1918 it is worthy of note that throughout the past season, 1919, these insects were exceedingly scarce. Whether this was due to parasites, or weather conditions, or other controlling factors I am unable to say. A close watch was kept throughout the summer for any sign of their activities but I only succeeded in locating one nymph on June 14th, and two pairs of adults and one female on August 13. These last were collected for egg records and I was able to keep them in the laboratory until the beginning of October.

In his Report of Forest Insects for 1878, I find that the late Doctor Riley, of the United States Bureau of Entomology, refers to a communication received from a Mr. Snow, of Yates Co., N. Y., in which the latter states that walking sticks were unusually abundant every other year and that many of the eggs were found to remain on the ground for two consecutive winters before hatching. A further reference in this same report is made to the investigations of Messrs. Bringham and Trouvelot. These gentlemen, writing in the Proceedings of the Boston Society of Natural History, Volume XI, pages 88 to 89, observed that the eggs of the walking stick only hatch after an interval of two years.

Eggs laid in the summer of 1918 and held in storage for winter and spring in a box of sand left exposed to the atmosphere failed to hatch last summer. Those of 1919 were put into glass vials corked with loose cotton batting and left on the laboratory table in a temperature averaging about 70 degrees. On January 28th, 1920, I examined several of these and found them well advanced in their embryonic development. About 18th February, much to my astonishment, a nymph made its appearance in one of the bottles, to be followed by several others at irregular intervals. I had nothing at the time to feed the youngsters on except rock fern (*Pteris* sp.) to which they did not take happily. Later I tried several kinds of green foods, lettuce, tradescantia, geranium, etc., and dried oak leaves soaked in water, but to no avail. The nymphs all died.

Notes on Habits. The Phasmids have been popularly considered harmful and poisonous. Such is not the case. In fact the very reverse is the truth. They are quite harmless, inoffensive creatures, strict vegetarians and easily managed in confinement. One large female, I had in the house for three months and made quite a pet of her. I would often remove her from the cage and allow her to walk over a pot of ferns on the table. She would meander up and down on the green leaves, not attempting to drop to the table or trying to get away. If I put water on the leaves she would immediately take some up and blow it out from her mouth in the form of a bubble, then draw it in and blow it out again, keeping this up for some time, as it were for my amusement. Again I would place her on the table near an electric light. She would walk towards it, hesitate, look around as if uncertain what next to do, then rear herself, spreading out her long front legs to the light, as much as to say "Humph!

I wonder what that is?" and all the time waving her antennae, much the same as a cockroach will do when on the scent for food. After the frost came, killing most of the vegetation, I would gather a few dried oak leaves and soak them in water for her. These she would eat sparingly of, often preferring only to drink up what moisture there might be on the leaf surface. Finally I could get nothing more green for her in the garden and tried a sprig of white pine needles. These she refused. Her egg record dropped to one a day and this only at spasmodic intervals. She was getting weak and helpless. One night I found she had fallen to the bottom of the cage and seemed unable to move. Next morning she was dead.

Walking Sticks are remarkably strong and adhere tenaciously to clothing, netting or roughened surfaces from which it is difficult to remove them without injury, since the legs break easily. Very smooth surfaces are no hindrance to their movements due to the circular white pulvillus, or suction pad on each tarsus, and they will walk up or down the sides of a glass cage quite as easily as on the flat table. Feeding usually takes place at night, and during the day they rest quietly, for the most part at the top of the cage on the cloth covering, head and back downwards. The males spend most of their time *in coitu*, eating little or nothing in confinement. They are the first to die, the females living on for weeks afterwards to deposit their eggs.

Injury. At Aylmer any damage done by this insect so far as I have observed has been negligible. There are, however, localities in the States where the walking stick has proved a serious pest. Mr. Fernald, Economic Zoologist at Harrisburgh, Pa., 1898, reports the appearance of walking sticks near Duncanville Pa., "in countless numbers." The trees attacked were mostly chestnut, oak, and maple, the area of infestation being over one mile long and half a mile wide. Mr. Snow of Yates Co., N. Y., in a letter to Doctor Riley in 1878 relates how walking sticks "had stripped 25 acres of young timber, mostly white oak and hickory, on his reservation."

That such severe infestations as these are likely to occur in Canada I am inclined to doubt, but in the warmer sections, such as Niagara Glen, minor, local outbreaks may take place, as for example that referred to in Ont. Ent. Report, 1904. However, these creatures are very susceptible to cool weather and it is quite possible that the early frosts of the more northern latitudes play a considerable part in their control.

Control. The following control methods have been recommended by Doctor Riley: Poison the vegetation by spraying with Paris green to kill off the very young nymphs and destroy eggs by digging, or burning the grass and vegetation. These appear to be very effective measures but I have had no opportunity so far to test any of them. One female stick in a sickly condition, I secured this summer had eight or ten tachinid eggs on different parts of the body. She refused all food and died two days after being brought into the laboratory, the body becoming quite limp and withered. I kept the specimen in a vial for closer examination, but no evidence of parasites was observed so concluded that their life cycle had been interrupted by the death of the host which perhaps was brought about by some other agency than the fly itself.

SOME NEW SPECIES OF THE GENUS LONCHÆA (DIPTERA, LONCHÆIDÆ).

BY J. R. MALLOCH,
Uabana, Ill.

Lonchæa major, sp. n.

Male.—Shining black, with a slight bluish tinge. Antennæ and palpi black; arista yellowish at base. Legs pitchy black, the hind tarsi hardly paler than their tibiæ. Wings hyaline, veins brownish yellow, whitish at bases. Calyptræ white, fringes concolorous except at junction of upper and lower, where there are some long, black, setulose hairs. Halteres black.

Eyes bare; frons about twice as long as wide, parallel-sided, surface with short, moderately dense hairs; upper orbits slightly rugose above, bare; frontal lunule hairy; longest hairs on arista over twice as long as its basal diameter; third antennal segment about four times as long as its width, extending to mouth margin. Scutellum with setulose hairs on margins and between apical bristles, the disc bare; pteropleura bare; no hairs adjacent to the stigmatal bristle. Abdomen broad, with rather dense, short, setulose hairs on dorsum; fourth tergite about 1.5 as long as third. Hind femur without distinct anteroventral bristles. Auxiliary vein almost fused with first at its apex.

Length 6.5 mm.

Type.—Amazon, South America. Type in British Museum.

Lonchæa nigrocærulea, sp. n.

Male.—Blue-black, almost metallic in colour. Antennæ and palpi black; arista pale at base; upper orbits and ocellar triangle glossy. Legs black. Wings, calyptræ, and halteres as in *major*.

Frons about 1.5 as long as wide, sparsely hairy; upper orbits highly glossy smooth; third antennal segment about four times as long as wide, extending below mouth margin; arista as in *major;* palpi dilated, slightly protruded. Praescutellar acrostichals very long; scutellum as in *major;* pteropleura bare; no bristly hairs adjacent to stigmatal bristle. Abdomen with longer hairs than in *major*, especially at apex of fourth tergite; fourth tergite about twice as long as third. Venation as in *major*, but the antepenultimate section of fourth vein is only two-thirds as long as penultimate, whereas in *major* it is three-fourths as long. Hind femur with a few distinct anteroventral bristles.

Length 4 mm.

Type.—Barbados (E. F. Becher). Type in British Museum.

Lonchæa striatifrons, sp. n.

Male.—Glossy steel-blue, the abdomen paler than the thorax. Frons shining black, ocellar spot and upper orbits glossy blue; third antennal segment reddish at base below. Legs black, tarsi with the exception of the apical two or three segments reddish testaceous. Wings clear, yellow at bases. Calyptræ white, fringes concolorous. Halteres black.

Frons less than twice as long as wide at anterior margin, not distinctly

narrowed anteriorly, the surface of interfrontalia finely striate on upper half laterally; orbits narrow, distinctly separated from ocellar triangle posteriorly their surfaces microscopically diagonally striate anteriorly; hairs on frons short and sparse; third antennal segment three times as long as wide; cheek narrow, without dense hairs or strong bristles. Thorax as in *polita* Say. Basal abdominal sternite with some hairs on each side. Legs and wings as in *polita*. Fringes of calyptræ longer than usual, about six of the hairs at apex of the fold setulose and longer than the calyptræ.

Female.—Frons at least one-third of the head-width and less than 1.5 as long as wide, not so distinctly striated as in male. Ovipositor as in *polita* Say.

Length 4–4.5 mm.

Type.—Male, allotype, and one male paratype, Santa Clara, Cal. (Baker); one male, San Diego, Cal. (Harkins collection); one male, Palo Alto, Cal., August 3. Type in collection of University of California.

Lonchæa bakeri, sp. n.

Female.—Glossy black, without distinct bluish tinge, the frons greenish blue anteriorly. Face and cheeks with whitish pruinosity; frons shining upper, orbits and ocellar triangle glossy; antennæ brownish black. Legs black, tarsi yellow, apical two segments darkened. Wings clear, veins yellow. Calyptræ and their fringes white.

Frons at vertex one-third of the head-width, not narrowed anteriorly, its length about 1.5 of its width, surface microscopically striate on upper half granulose anteriorly, with sparse hairs: upper orbits almost imperceptibly striate; third antennal segment not twice as long as wide; face not carinate, cheek with 3 or 4 strong, but not very long bristles on lower margin anteriorly. A strong bristle on upper margin of mesopleura a little behind spiracle and considerably cephalad of the vertical series at anterior margin of haired area; scutellum without hairs between apical bristles. Ovipositor not broad, the apical hairs very short. Hind femora without antero-ventral bristles; antero-dorsal setulæ on hind tibiæ stronger than usual. Veins 3 and 4 very slightly convergent apically. Fringes of calyptræ normal.

Length 3 mm., exclusive of ovipositor.

Type.—Chinangega, Nicaragua (F. C. Baker).

Named in honour of the collector.

This species is closely allied to *albiceps* Malloch, having the same armature of the mesopleura, and the same type of frons but without the transverse depression, and the calyptræ white, and venation different.

Type in collection of University of California.

AN ADDITION TO BIBLIOGRAPHY ON AGRILUS (Coleop.).

Through an oversight on our part, a recent paper of Burke's was omitted from the *Agrilus* bibliography, (Can. Ent., Sept., 1920, p. 204), and is given below.

Burke, Jour. Econ. Ent., Vol. 10, No. 3, pp. 325–332, 1917. Contains notes on food plants and habits of *Agrilus angelicus* Horn, *A. niveiventris* Horn, *A. granulatus* Say, *A. anxius* Gory, *A. acutipennis* Mann., *A. politus* Say.

C. A. Frost and H. B. Weiss.

OVIPOSITION BY AN EVANIID, EVANIA APPENDIGASTER LINN.

BY VERNON R. HABER,
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Recently the author and his wife witnessed oviposition by an ensign fly, *Evania appendigaster* Linn, in an egg mass of an Oriental cockroach, *Blatta orientalis* Linn.

On Sunday evening, August 8, 1920, as the female Evaniid drank from a drop of water which accidentally had been spilled upon the floor of our room she was captured by inverting an ordinary glass tumbler over her, slipping a piece of paper between the mouth of the tumbler and the floor upon which it rested. As this was done the Evaniid leaped upon the inside wall of the tumbler, soon becoming rather restless, for she ran over the inside surface of the glass and over the piece of paper upon which it rested.

Fortunately we had at our disposal an egg mass of a cockroach, *Blatta orientalis* Linn. which had been deposited in the morning of the same day that we captured the Evaniid. By slightly tipping the inverted tumbler we

Fig. 23.—Oviposition of *Evania appendigaster* L.

shoved the Blattid egg mass beneath it. Much to our surprise almost immediately there in bright electric lamp light the Evaniid left the inside wall of the confining tumbler, ran over the Blattid ootheca, crawled over the surface momentarily as she actively vibrated her antenna and finally settled upon it with the long axis of her body parallel with the long axis of the egg mass as it lay upon its right side. Having satisfactorily settled herself, lying upon her right side she extended her ovipositor and crawling slightly forward she punctured the ootheca in the fifth egg cell of the left side, remaining in position for about fifteen minutes. She then left the egg mass and resting upon the inside wall of the tumbler actively cleaned the ovipositor, wings and antennae. Later, at 10.00 p.m. I turned the ootheca that it rested upon its left side. She revisited it but soon ran a short distance away and continued to clean her legs, wings and antennae. On the following day we introduced another freshly deposited egg mass of the same species of cockroach. The Evaniid visited it and running inquisitively around it several times she finally tried to turn it upon its opposite side by running across the middle of its length dragging the hind legs that they hooked the flanged edge of the ootheca. She failed to turn it completely over and left it, apparently little concerned by its presence.

X of the figure represents the ootheca of *Blatta orientalis* Linn. lying upon its right side and the Evaniid in position as she oviposits in the puncture which she has made at (a).

Y of the figure shows the ootheca still in the same position as in X, but the Evaniid has left it, showing the oviposition puncture at (a).

NOTES ON THE COLEOPTERA WITH DESCRIPTION OF NEW SPECIES.

BY C. A. FROST.
Framingham, Mass.

(Continued from page 232.)

Chrysobothris verdigripennis Frost. My type material was taken at Wales, Maine, on July 23, 1908, and fortunately included both sexes and the extremes of colour variation. Considerable study was given the series the following winter, and the characters were carefully worked out so that it was apparent that an undescribed species was at hand. After this, specimens were submitted to Mr. Blanchard who made further investigations, and to whom the entire series was sent for a description of the species. He delayed this for some months, and when he suggested turning it over to another specialist, I requested the return of the specimens and finished my investigations.

Since the description (Jour. N. Y. Ent. Soc., Vol. XVIII) I have seen but one living specimen, which was resting on the trunk of a lone hemlock in a small clearing at Monmouth, Me., July 18, 1915. I approached too cautiously, and as it took wing the net missed it by an inch. He who would capture this agile and watchful insect must be quick and sure, for it tarries not. I recall that the original series were resting on beech trunks in the hot July sunshine, and after losing several I tried making a quick leap, thrusting the net below them and smashing down on them with my hat or a bunch of ferns as they rose; This method resulted in sweeping some of the specimens into the net.

I have also seen one specimen from Connecticut, two from Le Pas, Manitoba, (J. B. Wallis), one from Vermont, and a typical male from Port Maitland, Nova Scotia, August 2, 1910. A male I retained from the two Manitoba specimens (July 3, 1917) is only 11 mm. in length and a of dark bronze colour, but otherwise typical. Mr. A. S. Nicolay writes me that he has one from Lake Superior, and another from the Catskill Mts., New York, August 14, 1889.

Agrilus lateralis Say. The capture of a pair of this species by Mr. C. W. Johnson at St. Augustine, Fla., April 21, 1919, seems to add a new section of the country to the already wide distribution of this rather uncommon insect. The female of this pair is unusually large, 9.4 mm. It has been recorded from Maine (Wales, June 23, 192) to New Mexico.

Agrilus champlaini Frost. Since the description (Can. Ent., 1912) the male holotype has been deposited in the collection of the State Agricultural Experiment Station at New Haven, Conn. The female allotype and a typical male are still in my collection. The remains of an *Agrilus* that strongly resembles this species were dug, together with a dead *Saperda obliqua*, from a gall on *Alnus incana* at Framingham, Mass. The gall appeared to have been mainly the work of the *Saperda*. *Champlaini* was described from specimens reared from galls on the twigs of *Ostrya virginica*.

Agrilus criddlei, n. sp. Form of *anxius*, less elongate, olivaceous bronze, with bluish reflections, slightly shining; antennæ reaching beyond the middle of the thorax, serrate from the fourth joint, greenish bronze; front slightly concave, greenish, occiput very slightly impressed, median line reaching middle of front, surface with coarse, rough punctures irregularly confluent.

Prothorax about one-fourth wider than long, base equal to apex in width, sides feebly arcuate, margins slightly sinuous, hind angles with an evident but not sharply-defined arcuate carina, disk convex with a shallow basal depression in front of scutellum, and two vague foveæ in front of middle on each side, surface confusedly strigate, intervals punctate. Scutellum smooth, shining aeneous, not carinate.

Elytra very little wider than the thorax, slightly sinuate behind the humeri, a little wider at middle than at base, apices rounded serrulate, not acute; disk sub-convex with vague costæ, suture elevated behind the middle, basal depressions moderate, surface imbricate-granulate.

Body beneath more shining and more bronzed than above, pubescent; prosternal lobe emarginate, intercoxal process moderately broad, slightly concave, tip acute, surface coarsely punctate becoming asperate toward the tip, a smooth space at middle of lobe, propleuræ less coarsely punctured; metasternum with a central smooth, narrow groove, surface coarsely asperate at middle, becoming densely irregularly strigate at sides, on the coxal plates and metepisterna; first abdominal segment more finely strigate becoming more sparse at middle, rest of ventral segments sparsely punctulate, denser at sides; first ventral segment with a broad, shallow groove sparsely strigate above, smooth with a few asperities near second segment, on which it becomes smooth and vanishes near the posterior edge, last segment eroded truncate, vertical portion truncate and smooth; pygidium sparsely coarsely punctate with a projecting carina. Front and middle tibiæ feebly mucronate, hind tibiæ simple; claws deeply cleft on all the feet alike. Length 7.5 mm., width 2 mm.

The type is a male from Aweme, Manitoba, collected by Mr. Norman Criddle, to whom the species is dedicated. A male paratype from the same locality and date (June 25, 1903) is very similar except that the front is decidedly concave. There are at hand a male and a female from Toronto, Ontario, and a male from Rigaud, Quebec, all of which seem to belong to this species, but as there is but one tarsal claw, and that a middle one, among them, they will be merely noted. Dr. Horn mentions a single specimen of this species, without locality, under his remarks about *anxius* (Species of Agrilus of Boreal America. Trans. Am. Ent. Soc., Vol. XVIII).

The most evident character that separates this from *anxius* is the cleft claws of the hind tarsi, but there are many, more obscure, differences that appear to be constant when the insects are carefully studied. The head is broader between the eyes, front more concave, and more coarsely punctured, inner margin of eyes straighter, emargination of clypeus more shallow and abrupt, prothoracic margin less sinuate, sides less arcuate, base wider nearly equaling the elytra, emargination of the prosternal lobe less deep, beneath more coarsely and densely sculptured in general, cleft of claws more wide and deep.

Agrilus auricomus Frost. This species has so far turned out to be extremely local and occurs only for a very limited period, possibly less than a week. Specimens of both sexes were taken on a single red oak tree, June 14, 1913, in the same locality where the types were taken in 1909. On June 9, 1915, they were found on a red oak tree 200 feet north of 1913 locality. It has been found only on one tree in the same year, although careful search for it has been made on

all the surrounding oaks; no captures have been made after three days in succession, and in 1914, 1916, 1917, 1918 and 1919 none were found in the type locality. One specimen has been seen from Hubbardston, and a specimen was taken from tanglefoot on a white oak in Sherborn, Mass., in July.

Agrilus crataegi Frost. Since the description from Pennsylvania material the species has turned up in Edgebrook and Riverside, Ill. Specimens were taken by Mr. Emil Liljeblad, June 12 to 26, 1913, and June 20 and 27, 1914, and others by Mr. Carl Selinger on June 11, 1915. A large number of both sexes have been examined from this locality, and but one slight colour variant noted; in this the cupreous reflections of the posterior fourth of elytra are wanting. Two specimens have been seen from Virginia, taken in June by Mr. Nathan Banks.

Telephorus neglectus Fall. This species was first discovered in the pupal state while digging up an abandoned ant hill, April 30, 1910. They were of a pinkish colour and soon changed to nearly black. Other pupæ were found April 27, 1913, and changed to adults on May 4.

In comparing these adults with supposed *carolinus* the difference in the form of the claws was noticed and specimens of both forms were sent to Dr. W. Horn, of Berlin, Germany. He submitted them to M. Pic, who pronounced them both *carolinus*, but Dr. Horn agreed with me that the specimens with the claws basally toothed (*neglectus*) must be placed near *dentiger*. The type of *dentiger* was then examined and found to be entirely different. There might seem to be some question which of the two species was before Fabricius, but from the known habitat of *neglectus* it is probable that the more widely-distributed and generally accepted form is the true *carolinus*.

Besides the ungual characters, the elytra are more coarsely granulate-punctate and slightly more shining, the second and third antennal joints are more nearly equal in the female of *neglectus*. There is also a small angle of the yellow (sometimes pinkish) border entrant into the base of the dark thoracic disk at the middle; while this is an apparently trivial thing, it is constant in my large series, and the species were separated by this character before using a lens to examine the claws.

Laricobius erichsoni Rosen. Several specimens of this rarely-taken beetle were found on willow catkins at Sherborn, Mass., April 19, 1913, and May 8, 1909. In 1919, on May 18, one was swept from the flowering shrubs of *Rhodora canadensis* at Framingham.

Geotrupes horni Blanchard. The recorded range of this species is considerably extended toward the northeast by the capture of two specimens at Monmouth, Me., while digging under fungi on September 4 and 9, 1917.

Disonycha funerea Rand. A specimen has been taken at Wellesley, Mass., by Mr. A. P. Morse, May 9, 1892, and I have seen another one in the collection of Mr. E. J. Smith, of Sherborn. It was originally described from Florida; there are two specimens in the Harris collection from Georgia.

Barynotus schoeneri Zetterst. In the "Rhynchophora or Weevils of North Eastern America", by Blatchley and Leng, this species is recorded as having been taken at Wales, Me., and Framingham, Mass. This is an error due to my carelessness in not verifying the characters of a species of *Panscopus*

(probably *erinaceus*) after getting the name from another collection. My single *Panscopus erinaceus* was so discoloured that I did not until recently recognize their resemblance.

Allandrus brevicornis, n. sp. Form shorter and more robust than *bifasciatus*, black to piceous black with a brassy tint in some specimens. Head and beak densely, closely punctured with sparse white pubescence, beak dilated at tip, with a very fine but distinct carina extending from in front of the eyes nearly to the front margin, eyes prominent; antennæ dark piceous, reaching the hind angles of the prothorax in the female and passing them by the length of the club in the male, first joint short; second nearly equal to third but stouter; third longer than the fourth which is equal to fifth; sixth, seventh and eighth nearly equal, shorter and broader; club flattened, first joint as long as next two. Prothorax closely punctured, gradually narrowed in front and abruptly behind the remote transverse ridge which is nearly straight in the transverse portion and flexed forward at the sides where it is distinct nearly to the middle of the prothorax. The grayish-white pubescence is irregularly distributed and more evident in front of the scutellum, at basal angles and front margin. Elytra with lightly impressed, deeply punctate striæ; the punctures are larger and more widely separated on the disk near the base, becoming finer and less distinct toward the apices, intervals densely, finely granulate-punctate, the whitish pubescence which is very sparse is condensed on the scutellum, in a median fascia, which extends along the suture to base but does not reach the margins at the sides, in a less-defined fascia at the declivity, and at the apex. Beneath more densely pubescent with grayish-white hairs, which are more evident on the prosternum, densely punctate, more shallowly on the abdomen. Length 2 to 3.8 mm. Width 0.8 to 2.6 mm.

This species differs from *bifasciatus* in its shorter form, black colour, darker antennæ and legs, shorter and more widely dilated beak, more prominent eyes, narrower and more densely-punctured intervals of the elytra, larger, deeper and more crowded punctures of the striæ, and more especially by the very fine carina of the beak (which is so elevated in the male of *bifasciatus* as to nearly equal in height one-half of the width of the beak), and the length of the male antennæ (which in *bifasciatus* is equal to the entire body exclusive of the beak). The sparse pubescence gives it the appearance of a black insect, while the dense pubescence of *bifasciatus* causes it to appear as a grayish one. The first three abdominal segments of the male are slightly flattened.

This species has been taken frequently by beating dead willows at Framingham, Mass., June 19 to July 27. One male from Monmouth, Me., differs in the less distinct carina of beak which seems to be situated at the bottom of a shallow concavity. I have taken in all at least a dozen specimens of this, but none of the real *bifasciatus*, while in the Blanchard collection there are 10 specimens of the latter and none of *brevicornis*. I have at hand two female specimens belonging to Mr. F. S. Carr, of Edmonton, Alta., which were taken there on July 30, 1916, and June 11, 1918. One of these is much larger (3.8 mm.) than any of mine, and the whitish pubescence is more dense, contrasting strongly with the black denuded places. The carina of the beak in this specimen is nearly obsolete.

The disposition of the types is as follows: Two in the collection of Mr. F. S. Carr, Edmonton, Alta., one each in the Museum of Comparative Zoology at Cambridge, the collection of the Boston Society of Natural History, the National Museum collection at Washington, the collection of H. C. Fall, and seven in my own collection.

A SYNOPTIC REVISION OF THE ANTHOMYIID GENUS HYDROPHORIA ROBINEAU-DESVOIDY (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

The species of this genus with the exception of *subpellucens* Malloch are entirely black, with the tibiæ yellowish in a few cases. The thorax is usually distinctly trivittate, and the abdomen has a black dorsocentral vitta. With the single exception of *nigerrima* Malloch the American species known to me have the halteres with yellow knobs, and all have the arista distinctly hairy.

There are, I consider, two genera included under this generic name, separable as indicated in the first two captions of my key, but it is impossible for me to decide with the data available to me what the correct generic names are. Acroptena Pokorny is undoubtedly applicable to the group with hairy hypopleura, this character being used in this key for the first time, but whether Hydrophoria is synonymous or not I am unable to say as I do not have the type species before me. My object at this time is to place before students of the family data for the identification of their material in the composite group, such being of more importance than the separation of the larger segregates.

It is not at all improbable that some of the species recently described by me from America will eventually prove to be the same as European species previously described, but the species are so very similar that only a comparison of European and American examples will suffice to decide their specific identities. Comparison of European examples of *ruralis* Meigen and *subpellucens* Malloch proves that they are very closely allied if not identical, but there are some characters which do not agree entirely, and for the present I have decided to consider them as distinct.

The larvæ, so far as I know, are aquatic, and the species are mostly northern in their distribution, commonest in the northwest.

Key to Species.

MALES.

1₂ Hypopleura with some long hairs on upper margin in front of spiracle....2.
Hypopleura bare....8.

2. Halteres black; deep black species, with thorax and abdomen almost devoid of gray pruinescence; eyes separated by more than width across posterior ocelli, the orbits each with a series of long hairs along the inner margin....*nigerrima* Malloch
Halteres with yellow or pale knobs; thorax and abdomen with gray pruinescence; eyes usually separated by less than width across posterior ocelli....3.

3. Basal segment of hypopygium with very many stout bristles which are

downwardly directed and slightly curved; the segment before it glossy, with 3 long bristly hairs on each side of disc.....*arctica* Malloch.

Basal segment of hypopygium either with short hairs or bristles on sides or with slender bristly hairs, or the segment in front of it is highly glossy and bare, or pruinose and sparsely hairy.....4.

4. Segment in front of basal hypopygial glossy, bare; hind tibia with 4 posterodorsal bristles.....*polita* Malloch.

Segment in front of basal hypopygial more or less pruinescent and with numerous bristly hairs.....5.

5. Upper calyptra dark-haired at lateral angle; bristles on abdominal tergites most dense and stronger on the portions incurved ventrad.....*katmaiensis* Malloch.

Calyptræ entirely pale-haired; bristles on tergites strongest at apices on dorsum.....6.

6. Mid femur with 3 or 4 short, strong bristles on basal half of anteroventral surface; hind tibia with 3 posterodorsal bristles.....*occidentalis* Malloch.

Mid femur without bristles on basal half of anteroventral surface; hind tibia with 2 posterodorsal bristles.....7.

7. Eyes separated by more than width across posterior ocelli; mid tibia with a small, anteroventral bristle; processes of fifth abdominal sternite moderately stout, with very minute hairs on their apical halves, and a sparse fringe of hairs on their inner margins on basal half.....*proxima* Malloch.

Eyes separated by less than width across posterior ocelli; mid tibia without an anteroventral bristle; processes of fifth abdominal sternite slender, with long hairs to apices, their inner margins with a fringe of closely-placed, rather long hairs on basal half.....*divisa* Meigen.

8. Fourth tergite (third visible) without a dense tuft of fuscous bristly hairs, which are backwardly directed, at each posterior lateral angle.....9.

Fourth tergite with a tuft of fuscous bristles or hairs at each posterior lateral angle.....13.

9. Abdomen with sides of second and third tergites largely yellowish testaceous; legs brownish, not deep black; arista with its longest hairs about as long as width of third antennal segment.....*subpellucens* Malloch.

Abdomen and legs entirely black; longest hairs on arista not as long as width of third antennal segment.....10.

10. Hind tibia with a few bristly hairs on posterior surface basad of middle.....10 a.

Hind tibia without bristly hairs on posterior surface; hypopygium with strongest bristles at or near its base.....11.

10a. Narrowest part of frons not wider than distance between posterior ocelli; process of fifth sternite elongate, subcylindrical, their inner margins with a few fine hairs, their outer margins with some long bristles.....*galeata* Malloch.

Narrowest part of frons as wide as distance across posterior ocelli; process of fifth sternite short, broad, glossy, their inner margins fringed with long, fine hairs, their outer margins bare.....*seticauda* Malloch.

11. Parafacial in profile at base of antennæ distinctly broader than third antennal segment; eyes separated by at least as great a distance as width across posterior ocelli; processes of fifth sternite broad, fringed along their inner margins with fine hairs, the disc with a few bristly hairs.....12.

Parafacial in profile at no point as broad as third antennal segment; eyes separated by about width of anterior ocellus; processes of fifth sternite narrow, fringed along their inner margins with hairs which apically become longer and are incurved, the disc with long, bristly hairs which are similar to those on inner margins.....*uniformis* Malloch.

12. Thorax with at least one pair of well-developed presutural acrostichals; mesopleura with 3 or 4 bristles near upper anterior angle.....*coloradensis* Malloch.

Thorax without distinguishable presutural acrostichals, with fine hairs only; mesopleura with a few bristly hairs near anterior upper angle .12a.

12a. Longest hairs on arista much longer than its basal diameter; hind tibia with three posterodorsal bristles.....*flavohalterata* Malloch.

Longest hairs on arista not as long as its basal diameter; hind tibia with three long and one or two short posterodorsal bristles *congrua* Malloch.

13. Fourth (visible) tergite at middle much shorter than third; hind femur without bristles on posteroventral surface except one at apex and a small one near base; arista plumose basally.....*elongata* Malloch.

Fourth tergite at least as long as third; hind femur with some bristles on basal half of posteroventral surface.....14.

14. Third tergite with very short bristles in lateral tuft, the tuft not conspicuous, the tergite not much narrowed laterally; longest hairs on arista longer than its basal diameter.....*borealis* Malloch.

Third tergite with a conspicuous tuft of long bristles at lateral margin, the tergite much narrowed laterally.....15.

15. Longest hairs on arista about as long as width of third antennal segment; tergal tuft very dense, the bristles rather uniform in length, not extending beyond apex of fourth tergite.....*ambigua* Meigen.

Longest hairs on arista not longer than its basal diameter; tergal tuft not very dense, the bristles of unequal lengths, some of them extending to apex of abdomen.....*alaskensis*, sp. n.

FEMALES.

1. Hypopleura with a few long hairs on upper margin in front of spiracle, rarely these hairs absent or almost so, but all species have the orbits with a number of setulose hairs, which are sometimes very long, laterad of the supraorbital bristles; apical genital segment without short-curved spines.....2

Hypopleura bare; no setulose hairs laterad of the supraorbitals; apical genital segment with a few short-curved spines or bristles besides the usual hairs.....5.

2. Halteres black; mid femur with a few strong bristles and numerous long setulose hairs on anteroventral surface; parafacial in profile distinctly broader than third antennal segment.....*nigerrima* Malloch.

Halteres with yellow knobs.....3

3. At least the hind tibia partly or entirely yellowish testaceous; mid tibia without an anteroventral bristle; hind tibia with 2 posterodorsal bristles ..... *divisa* Meigen.
   All tibiæ black; mid tibia with an anteroventral bristle; hind tibia with 3 or more posteroventral bristles ..... 4.
   All tibiæ black or fuscous; mid tibia with an anteroventral bristle; hind tibia with 2 posterodorsal bristles ..... *proxima* Malloch.
4. Dorsum of thorax and abdomen slightly blue-gray pruinescent; longest hairs on arista much shorter than width of third antennal segment; mid tibia with one anterodorsal bristle ..... *arctica* Malloch.
   Dorsum of thorax and abdomen densely pale gray pruinescent; longest hairs on arista at least as long as width of third antennal segment mid tibia with 2 anterodorsal bristles ..... *polita* Malloch.
5. Legs brown or dull yellowish, not deep black; basal dorsal abdominal segment largely yellowish testaceous on each side; hind tibia with 2 posterodorsal bristles; longest hairs on arista distinctly longer than width of third antennal segment; small species, not over 5 mm. in length ..... *subpellucens* Malloch.
   Legs deep black; abdomen not yellowish at base; hind tibia with 3 or more bristles on posterodorsal surface, the basal one sometimes very weak ..... 6.
6. Hind femur with several long hair-like bristles at base on posteroventral surface ..... 7.
   Hind femur with one bristle at base on posteroventral surface ..... 11.
7. Costal thorns both small, sometimes barely distinguishable from the adjacent setulæ, never as long as the inner cross-vein; parafacial in profile conspicuously narrowed below, not nearly as wide as third antennal segment at lower margin of eye ..... *uniformis* Malloch.
   At least one of the costal thorns long and conspicuous, sometimes as long as the inner cross-vein; parafacial in profile but little narrowed below, as wide as third antennal segment for nearly its entire length ..... 8.
8. Hairs on arista not longer than its basal diameter; mid tibia with 2 anteroventral bristles; spines on apical genital segment short and strong, 12–14 in number; hind tibia with one or more posterior setulæ ..... *alaskensis*, sp. n.
   Hairs on arista much longer than its basal diameter; mid tibia with 1 anteroventral bristle ..... 9.
9. Thorax with two or three pairs of weak acrostichals and some hairs in front of suture; genital segment similar to that of *alaskensis* ..... *seticauda* Malloch.
   Thorax with central area in front of suture with 4 or 6 series of weak hairs ..... 10.
10. Apical genital segment with about a dozen short, strong spines; hind tibia with 4 posterodorsal bristles ..... *borealis* Malloch.
    Apical genital segment with 2 fine, short bristles and some hairs; hind tibia with two or three posterodorsal bristles *flavohalterata* Malloch.
11. Mid tibia with one or more short bristles immediately basad of the anterodorsal one; thorax with two or three pairs of presutural acrostichals ..... *elongata* Malloch.

Mid tibia without short bristle above the anterodorsal one; thorax usually without presutural acrostichals.....*ambigua* Meigen.

Hydrophoria alaskensis, sp. n.

Male and Female.—Thorax indistinctly trivittate. Abdomen with distinct dorsocentral vitta. Legs black. Wings slightly brownish in basal cells. Calyptræ white. Halteres yellow.

Male.—Narrowest part of frons about one-tenth of the head-width; parafacial at base of antennæ at least as wide as third antennal segment; longest hairs on arista about twice the basal diameter of arista; cheek about one-fourth as high as eye. Presutural acrostichals weak. Abdomen with very long bristles on sides of third tergite, some of which extend to or beyond apex of abdomen. Fore tibia with one anterodorsal and one posterior bristle at middle; mid tibia with two anteroventral, one or two anterodorsal, and four posterior bristles; hind tibia with four or five anteroventral, an uneven series on anterodorsal, and three posterodorsal bristles, and a few weak posterior setulæ.

Female.—Eyes separated by about one-third of the head-width; interfrontalia with a pair of cruciate bristles.

Length 5 mm.

Type.—St. George Island, Behring Straits, June 8, 1914. Allotype and 72 paratypes, same locality, June 10–25, 1914, (G. D. Hanna). Paratypes, 6 specimens, St. Paul Island, Alaska, August, 1910, and three specimens, Pribilof Islands, Alaska, August, 1910, (H. Heath).

The specimens from St. George Island are in the collection of the United States Bureau of Biological Survey, those from the other localities are in the collection of the University of California.

The description of this species was written about six years ago from a report of the insects of the Pribilof Islands which has not yet appeared in print, and it is now included to make as complete as possible the synopsis in this paper.

THE PEA MOTH A NEW SPECIES.

By Carl Heinrich,
Washington, D. C.

Laspeyresia novimundi, n. sp.

Palpi, face, head and base of patagiae dirty, whitish ochreous. Thorax dark lead gray. Fore wings dark greyish fuscous with a leaden gloss and in apical third a faint red brown suffusion; on costa from middle to apex six short white geminate dashes inwardly margined by black; from the first of these extends a lead bar joining and forming with the inner vertical bar of ocellus a narrow glossy and fairly distinct, angulate fascia; from the third geminate dash a similar and parallel leaden streak runs toward but does not quite meet the outer vertical bar of the ocellus; between the two a thin irregular line of black scales; ocellus with four short, narrow, longitudinal lines, bordered on inner and outer sides by a vertical bar of semi-lustrous lead coloured scales; cilia concolorous with wing. Hind wing dark brown, somewhat paler toward base; cilia pale brown at their base shading to white beyond. Underside of fore and hind wings a

uniform light semi-lustrous brown; costal dashes of fore wing rather faint,

Fig. 24.—*Laspeyresia novimundi*, male genitalia.

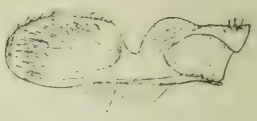

Fig. 25.—*Laspeyresia nigricana*, harpes.

legs greyish ochreous; hind tibiae and tarsi not banded. Male genitalia of type figured. Alar expanse 12-13 mm.

Habitat. Sturgeon Bay, Wisconsin.

Foodplant. Garden and Field Peas. Eight moths reared by C. L. Fluke Jr. of the Wisconsin Agricultural Experimentation Station from larvae feeding in the pods. Moths issued in July.

Type. Cat. No. 23514, U. S. N. M.

This is the species that was identified by Prof. Fernald as the European Pea Moth *Laspeyresia nigricana* Stephens and has so figured in our literature. It was first reported from Canada, destruction to peas in Ontario, Quebec and Maritime Provinces (Fletcher: Experimental Farms Report for 1897, pp. 194-195). Under the name *nigricana* Stephens it appears in several bulletins (Chittenden: U. S. D. A. Bull. 33. 1902. pp. 96-98; U. S. D. A. Bull. 66. Pt. VII. 1909. p. 95). Kearfott records it in the List of Insects of New Jersey and had several specimens so named in his collection. In a recent bulletin by Mr. C. L. Fluke ("The Pea Moth, How to Control It," Bull. 310. Agri. Exp. State U. of Wis. April, 1920) the life history of the insect here described is given. In that publication also appears a note by the author questioning the correctness of the earlier identifications. I am now convinced that our pea moth is not *nigricana* or any of the other European *Laspeyresia*. The genitalic differences are quite distinct as the figures of the harpes show. If *novimundi* is not a native species that has gone over to the pea from some wild legume it has probably been introduced from the orient. At any rate the name *nigricana* does not apply and should be dropped from our lists.

APPOINTMENT OF THE DOMINION ENTOMOLOGIST.

The news of Mr. Arthur Gibson's appointment as Dominion Entomologist, which took place early in October, will undoubtedly be received with feelings of pleasure and satisfaction in entomological circles throughout Canada. Mr. Gibson's appointment is the natural outcome of his long and faithful service as senior officer of the Entomological Branch since its inception in 1914. He received his early training under the late Dr. James Fletcher, joining the latter officer's staff in 1899, and has long been recognized, both in the United States

and Canada, as an economic entomologist of wide knowledge and experience. His kindly and genial personality and his unfailing courtesy and fair-mindedness have made him justly popular among his colleagues.

Mr. Gibson is a Fellow of the Entomological Society of London, (Eng.); Fellow of the Entomological Society of America; Fellow of the American Association for the Advancement of Science; President of the Entomological Society of Ontario; Associate Member of the American Association of Economic Entomologists; Editor of the Canadian Field-Naturalist; Member of the Canadian Society of Technical Agriculturists, etc.

We extend to Mr. Gibson our hearty congratulations on his well-deserved promotion, and wish him every success in the new responsibilities that he has undertaken.

NOTES ON SOME COLEOPTERA TAKEN IN THE VICINITY OF DUNEDIN, FLORIDA, IN THE SPRING OF 1920, WITH DESCRIPTIONS OF NEW SPECIES.

BY W. S. BLATCHLEY,
Indianapolis, Indiana.

The work on my "Orthoptera of Northeastern America" delayed my trip to Florida in the autumn of 1919, and I did not reach Dunedin until Christmas day. After my arrival a severe illness prevented any collecting for six weeks or more, and led also to the abandonment of a contemplated trip to Marco and other points along the extreme southwestern coast of the State. The first collecting was done on February 14, and from then on until April 28, I was in the field almost every day. I had hoped that by staying two or three weeks later than usual I would find the full spring fauna emerging, and thus make amends in part for the time lost during the winter, but the season, as gauged by the blossoming of plants, was a fortnight or more late, so that in the main the species taken or observed were those of previous years prior to April 10. However, from time to time I ran across a species new or rare to the State, and these, with three or four believed to be hitherto unknown, are treated on the following pages.

Bembidium picipes Kirby. A single specimen was captured Feb. 23 on a strip of bare muck along the margin of a pond near Dunedin. The first record for Florida. It was described from British America, is frequent in Indiana and ranges, according to Hayward,[2] from New England and Lake Superior, to Missouri, Kansas and Texas.

Lebia rhodopus Schwarz. A half dozen specimens have been taken about Dunedin, where it occurs from January to April on low ground vegetation; one is also at hand from Ft. Myers, Fla. The only other Florida record is that of the type from Tampa. Horn[3] made it an absolute synonym of *L. viridis* Say and not a variety as stated by Leng.[4] A careful study of the Florida specimens, as well as of a score or more taken in Indiana, substantiates my

1. See Can. Ent., April, 1917, 137.
2. Trans. Amer. Ent. Soc., XXIV, 1897, 83.
3. Trans. Amer. Ent. Soc., X, 1882, 130.
4. Bull. Amer. Mus. Nat. Hist., XXXIV, 1915, 585.

opinion[5] that *rhodopus* is a distinct species, the differences pointed out by Schwarz[6] holding good without variation throughout the series.

Lebia collaris. Dej. A single specimen was beaten from a bunch of Spanish moss in high, dry upland oak woods on April 20. It is 5.2 mm. in length, and agrees in every particular with Dejean's original description in which the length is given as 2½ lines, and breadth as 1¼ lines. The eyes are very prominent, as stated by him, the side margins of the thorax very broad, recurved and of nearly equal width throughout, while the outer joints of the antennæ are very dark brown. Attention is called to these points simply for comparison with examples of the following species which I had had in my collection for several years under the name of *collaris*, their determination having been made from Horn's "Revision of the Species of Lebia"[7] without access to Dejean's descriptions.

Lebia nigripennis Dej. Horn in his "Revision" makes this a synonym of *L. collaris.* From the text I judge that he did this without seeing Dejean's type of either species, as he says: Both Dejean's and Chaudoir's descriptions "do not seem to indicate any difference between *nigripennis* and *collaris* except in size and the colour of the head and thorax. These characters are ordinarily good, but in the present instance the colour of the head and thorax is seen to vary in our series." He then gives the length of *collaris* (including *nigripennis*) as 5 mm., whereas Dejean gives the dimensions of *nigripennis* as length 1¾ lines, breadth ¾ line, or 3.5 and 1.2 mm.

In the four specimens at hand, three from Dunedin and one from Sanford, Fla., the size is exactly as given by Dejean for *nigripennis;* the eyes are distinctly less prominent than in the *collaris* specimen above mentioned; the side margins of thorax are less wide and very evidently narrower toward the front angles; and the outer joints of antennæ are pale reddish-brown in all. Leaving aside the colour of the head, which is variable, these characters are, in my opinion, sufficient, when taken in connection with the much smaller size, to restore the name of *nigripennis*, as I believe that these small specimens represent the species which Dejean had before him in naming that form. In no one species of *Lebia* does the size vary as much as between these two forms, and Dr. Horn apparently ignored this difference in size when he combined the two and placed the length at 5 mm. The *L. collaris*, of Horn, is said by Leng to occur in the Middle and Southern States, and has been recorded from several stations in Florida.

Lebia fuscata Dej. This species is sometimes attracted by light, two specimens having been taken at porch light on March 15.

Aphelogenia vittata Fab. One example, April 19. This seems to be a rare beetle not only in Indiana but also in Florida. It is not mentioned by Schwarz, and is recorded only from Jacksonville and Lakeland by Leng.[8] All of my specimens from both States were taken by sweeping vegetation in low, damp localities.

5. Col. Ind., 1910, 145.
6. Proc. Amer. Phil. Soc., XVII, 1878, 354.
7. Trans. Amer. Ent. Soc., IV, 1872, 136.
8. Bull. Amer. Mus. Nat. Hist. XXXIV, 1915, 586.

Selenophorus ovalis Dej. My first specimen of this Carabid was found running across the sidewalk near the Club House Annex on March 16. Two others were taken at the same place on March 28. It is usually regarded as rare, is known only from Georgia and Florida, and resembles the more common *S. fossulatus* Dej., but is smaller and with the rows of dorsal punctures much less prominent.

Canthydrus addendus, sp. nov.

Elongate-oval, glabrous, shining. Head and thorax reddish-brown; the latter with front margin clouded with fuscous; elytra dark chocolate brown; antennæ, legs and under surface pale reddish-yellow. Head finely alutaceous, impunctate, much broader and more convex than in *C. gibbulus* (Aubé), the interocular space nearly twice as wide as there; clypeus much more broadly rounded; eyes larger, less convex, more coarsely facetted. Thorax with a few very fine punctures on the sides and along the front margin. Elytra oval, very convex at middle, the apical third strongly tapering; surface distinctly alutaceous, more coarsely and much more sparsely punctate than in *gibbulus*. Prosternal process behind the front coxæ narrow, spatulate, both it and median plates of meso- and metasterna very finely and sparsely punctate; hind margin of median metasternal plate subtruncate, its outer apical angles produced. Last ventral segment of both sexes compressed and subcarinate at middle. Length 3–3.2 mm.

Described from 20 specimens taken April 1 from a mass of water weeds in a shallow pond one mile northeast of Dunedin. Allied to *gibbulus* but distinctly larger and more convex. Besides the differences pointed out the median sternal plates of *gibbulus* are very coarsely and densely punctate, and the hind margin of the metasternal one is widely and deeply marginate. Cotypes of *addendus* are in the American Museum of Natural History and the collection of H. C. Fall.

Hydrochus minimus Blatch.[9] A second specimen of this minute and very distinct species was taken March 24 from a submerged board in the same pond as the preceding.

Coccinella 9-notata Hbst. Although this well-known species or its varieties are said to range over the entire United States, I can find no previous record of its occurrence in Florida. In a collection of beetles, mostly taken at porch light in July and sent to me from Dunedin, I found a single specimen.

Aulonium parallelopipedum Say. One specimen March 15 from beneath bark of dead water oak. Not before recorded from Florida but mentioned in the Schwarz MS. list[10] from Tallahassee and Crescent City.

Botrodus estriatus Casey. One specimen, Feb. 11. Beaten from dead limb of red bay at Skinner's hammock. Described from Texas.[11] No published record from Florida, but Schwarz (Ms.) has taken it at Crescent City.

Conotelus punctatus Schaeffer. This Nitidulid was described[12] from Lake Worth, Fla. I have taken it at Little River, Utopia and Dunedin by sweeping vegetation in low grounds. The elytra are brown with fine but distinct elongate punctures in evident rows.

9. Described in Bull. Amer. Mus. Nat. Hist., XLI, 1919, p. 317, from a unique.
10. See footnote, p. 419, Can. Ent., Dec., 1918.
11. Ann. N. Y. Acad. Sci., V, 1890, 320.
12. Journ. N. Y. Ent. Soc., XIX, 1911, 116.

Tenebroides floridanus Schæffer. A single specimen of this recently described[13] Ostomid is in my collection from Moore Haven, where it was taken March 2 from beneath the bark of a dead custard apple shrub. Schaeffer's type in the U. S. Nat. Museum was from Key West.

Limnichus nitidulus Lec. Four specimens have been taken about Dunedin where it occurs beneath bark of dead bay trees and on foliage of low plants. Described from Georgia. Recorded by Schwarz as very rare at Enterprise, Florida.

Agriotes insanus Cand. One specimen, March 20, beaten from oak. No. species of *Agriotes* has hitherto been reported from Florida. The range of *A. insanus* is given by Leconte[14] as, "Massachusetts to Illinois, Kansas and Texas." It is frequent in Indiana where it occurs on the greater ragweed, *Ambrosia trifida* L.

Agriotes oblongicollis Melsh. One specimen was taken March 21 by beating the foliage of the wax myrtle, *Myrica cerifera* L. Leconte[15] gives its range as "Georgia to Canada and Illinois." Although Leconte and Horn in characterizing the genus *Agriotes*[16] state that the front is "not margined behind the labrum," it is distinctly so margined in *A. oblongicollis*, as mentioned by Melsheimer in his original description[17].

Drapetes geminatus Say. Hitherto known from Florida only from Enterprise, where Schwarz found it "very rare." A single specimen was taken April 14 by sweeping ferns in Skinner's hammock.

Agrilus concinnus Horn. This large and handsome Agrilid was described[18] from "Georgia and Florida," without definite locality. A single example was swept from low huckleberry bushes on April 11.

Tytthonyx flavicollis, sp. nov.

Elongate-oblong, depressed. Elytra and legs black, strongly shining, finely pubescent; head, except front of occiput, thorax, scutellum, prosternum and side pieces of meso- and metasterna bright reddish-yellow, antennæ and under surface (except as noted) piceous black. Antennæ broad, very strongly serrate, second joint half the length of third, which is slightly shorter than the fourth. Thorax transversely elliptical, larger than in *erythrocephalus*, its margins thickened and angles all rounded; disc almost smooth and with a deep, entire median furrow. Elytra at base not wider than thorax, reaching second abdominal segment, their tips separately rounded; the disk of each with three distinct but feeble costæ, the intervals strongly transversely rugose. Last ventral with a small subacute median notch. Length 4.5 mm.

One male swept April 18 from the foliage of a low huckleberry. Differs from both *T. erythrocephalus* Fabr. and *ruficollis* Schæff. in colour, in sculpture of elytra and in the form of emargination of the last ventral.

Telephorus bilineatus Say. One specimen from beneath a chunk, March 31. I was surprised to find that this common northern Lampyrid was

13. Journ. N. Y. Ent. Soc., XXVI, 1918, 199.
14. Trans. Amer. Ent. Soc., XII, 1884, 15.
15. Loc. cited, p. 16.
16. Class. Col. N. Amer., 1883, 186.
17. Proc. Acad. Nat. Sci. Phil., II, 1845, 218.
18. Trans. Amer. Ent. Soc., XVIII, 1891, 310.

not heretofore recorded from Florida. Leconte gives its range[19] as "Atlantic region to Kansas."

Odontæus filicornis Say. A male of this uncommon Scarabid was taken at porch light on March 15. Horn gives its range[20] as "Middle and Central States," but Schwarz records one specimen from Enterprise and, in his Mss. notes, another from Tampa.

Ecyrus exiguus Lec. One specimen beaten from oak, March 22. The first record for Florida, its range being given by Leng and Hamilton[21] as Ohio, Georgia and Kansas.

Mecas femoralis Hald. One specimen taken by sweeping, April 20. Schwarz lists it as rare at Fort Capron and Crescent City.

Tetraopes tetraophthalmus Forst. Two specimens taken on milkweed July 15 and sent to me. This is another common northern species of wide range which has not before been recorded from Florida, though known from South Carolina, Louisiana and Mexico.

Cryptocephalus aulicus Hald. One specimen taken by sweeping vegetation along a sandy roadway. A rare species, resembling *Griburius larvatus* Newm. in colour and markings. Described from Georgia and known only from that State and Florida. Recorded by Castle and Laurent from Enterprise and noted in the Schwarz Mss. from St. Augustine.

Graphops varians Lec. Two specimens beaten from oak, March 19 and April 10. The first record from Florida. Leconte gives its range[22] as Illinois, Texas and Kansas.

Phyllotreta liebecki Schaeffer. This is the species recorded by me[23] under the name *Phyllotreta robusta* Lec. as common at Sanford along the borders of cypress swamps. Schaeffer's types were from Enterprise, and he states[24] that it is closely allied to *robusta* but in that species the "fifth antennal joint is prolonged at apex, and the last ventral has a very deeply impressed median line."

Synchroa punctata Newm. A rare species in Florida. Schwarz lists one specimen from Haulover and I took one, Feb. 27, and another, April 19, from beneath the bark of a dead red bay tree, *Persea borbonia* L.

Canifa pusilla Hald. One specimen July 15, at porch light. Described from South Carolina, frequent in Indiana, but not before known from Florida.

Tachygonus minutus, sp. nov.

Short, broadly oval. Black, strongly shining; legs and antennæ wholly testaceous. Beak reddish-brown, strongly shining, devoid of punctures; eyes large, almost contiguous; occiput very minutely and sparsely punctured. Thorax bell-shaped, coarsely and densely punctate on sides and with a large rhomboidal smooth space at middle, a tuft of white hairs near each hind angle and a thinner aggregation of similar hairs on sides. Elytra with double rows of coarse, deep punctures, each of which gives rise to a yellowish inclined seta; umbones promi-

19. Trans. Amer. Ent. Soc., IX, 1881, 54.
20. Trans. Amer. Ent. Soc., III, 1871, 50.
21. Trans. Amer. Ent. Soc., XXIII, 1896, 137.
22. Trans. Amer. Ent. Soc., XII, 1884, 26.
23. Can. Ent., XLVI, 1914, 142.
24. Journ. N. Y. Ent. Soc., XXVII, 339.

nent; intervals very narrow, the alternate ones feebly costate; a small divided and divergent sutural tuft of white hairs on basal third. Hind legs not much longer than the middle ones, armed on inner side with three or four minute teeth. Sides of meso- and metasterna coarsely punctate and clothed with white hairs. Length 1.3 mm.

Described from a single specimen taken April 19 by sweeping ferns in Skinner's hammock. Allied to *T. centralis* Lec., described from Colorado, but smaller, with head more finely punctate and sculpture of elytra very different.

Derolomus bicolor Lec. One specimen, April 23, from the leaves of a thistle on Hog Island. Known heretofore only from Enterprise, New Smyrna and Capron on or near the east coast of Florida.

Lixus leptosomus[25] Blatch. Two examples swept, April 11, from low herbage along the railway embankment north of Dunedin. The unique type from Sanford, Fla., was the only specimen hitherto known.

Barinus elusus, sp. nov.

Elongate, subparallel, convex. Black, shining; legs and antennæ reddish-brown; thorax with a broad stripe of transversely placed white scales on each side; elytra with the second intervals covered their full length with similar scales, bases of third, fourth and sixth intervals, side pieces of meso- and metasterna and sides of last three ventral segments similarly clothed. Beak stout, strongly curved, about three-fourths the length of thorax, very finely and sparsely punctate above, more coarsely on sides of basal half. Head finely alutaceous, finely and sparsely punctate. First joint of funicle two-thirds the length of the rest united. Thorax subcylindrical, one-fourth longer than wide, rather finely punctate, the intervals feebly alutaceous and equal in size to the punctures. Elytra scarcely wider at base and nearly twice as long as thorax, sides parallel to apical fourth, then strongly converging to the separately rounded tips; striæ narrow, deep; intervals flat, feebly alutaceous, each with a single row of rather fine, shallow, irregularly placed punctures. Under surface coarsely and densely punctate, the last three ventral segments more sparsely so. Length 3 mm.

Two specimens taken March 30, April 19 by sweeping along a roadway through Skinner's hammock. Allied to *cribricollis* Lec., but distinct in the more slender form, arrangement of white scales, longer thorax, alutaceous surface, etc.

Cylindrocopturus nanulus Lec. Five specimens beaten April 26 from the foliage of *Ampelopsis* in low, moist grounds. Known from Florida heretofore only from Enterprise.

25. Can. Ent., XLVI, 1914, 249.

Mailed December 13th, 1920

RHABDOPTERUS PICIPES Oliv.

Work of beetles on immature Grimes' Golden apples and on leaf of Virginia Creeper.

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POPULAR AND PRACTICAL ENTOMOLOGY.

The Cranberry Rootworm Beetle (Rhabdopterus Picipes) as an Apple Pest. (Coleoptera).

BY WESLEY S. SAWYER.
Cornell University, Ithaca, N. Y.

On June 28, 1920 the writer's attention was called to a peculiar injury to apples in an orchard near Sodus, New York. Small, bronze-coloured leaf beetles were found in great numbers feeding on the fruit. They were later determined by Mr. Charles W. Leng as *Rhabdopterus picipes* Oliv. This beetle is widely distributed throughout the eastern United States, ranging westward to the Dakotas and Texas. The beetles have been recorded as feeding on the leaves of basswood, myrtle, wild grape, and on the foliage and fruit of the cranberry. In the larval stage the insect is a serious enemy of cranberry, attacking the roots.

In the orchard at Sodus the beetles confined their attack to the fruit, especially Grimes Golden, eating out a shallow, irregular, hieroglyphic-like channel on the surface (Plate VIII). About 75 per cent. of the apples were injured in this manner. The beetles continued feeding until about the middle of July, after which time they were to be found feeding on the foliage of Virginia creeper, dock, and wild strawberry. Apple leaves were not attacked. When feeding on the foliage the beetles ate out holes through the leaf, shaped very similar to the channels on the fruit (Plate VIII); in some cases riddling the leaves so that only the veins remained. About the first of August the beetles disappeared.

During the past season, the work of the insect seemed to be confined to the vicinity of Sodus and Savannah, New York. In the latter place it was most abundant on the foliage of wild strawberry and dock. The damage to the apples in this locality was not great.

Attempts to kill the beetles by spraying with arsenate of lead were unsuccessful. Arsenate of lead (powdered) five pounds in one hundred gallons of summer strength lime sulphur was applied with great thoroughness, without either killing the beetles or driving them away.

NEW LEPIDOPTERA FROM BRITISH COLUMBIA.

BY E. H. BLACKMORE,
Victoria, B. C.

NOCTUIDÆ.

Cænurgia erechtea Cram. form **parva** form. nov.

This form is the spring brood of *erechtea* and is distinguished from the typical or summer form by its uniformly smaller size, measuring 35 mm. in alar expanse as compared with 42 mm. in typical *erechtea*.

The colours and markings of both male and female are exactly the same as in *erechtea* but, of course, on a reduced scale. It flies in April and May, while *erechtea* is not on the wing until July and August.

Described from 10 specimens, 6 ♂'s and 4 ♀'s collected by the author.

Holotype.—♂, Victoria, B. C., April 29th, 1913.

Allotype.—♀, Victoria, B. C., April 22nd, 1912.

Paratypes.—5 ♂'s, Victoria, B. C., April 22nd, May 4th, 6th, 13th, 1913, April 22nd, 1917; 3 ♀'s, Victoria, B. C., April 18th, May 4th, 1913, May 13th, 1917.

Types and paratypes in author's collection.

LASIOCAMPIDÆ.

Tolype dayi, n. sp.

Male.—Palpi seal brown tipped with white; front seal brown; thorax slate-grey shading into pale grey on metathorax, with the usual brown crest of raised scales; abdomen dark slate-grey shading into lighter grey laterally. Primaries light grey with median and sub-terminal spaces dark grey; maculation very close to *velleda*, but differs in the course of the outer edge of the median space, which is more sinuate in the new species.

The sub-terminal space is much narrower in *dayi* than it is in *velleda* and is of a more even width throughout. Terminal line white; fringe grey, paler externally. Secondaries, basal area smoky; median band paler followed by a sub-terminal smoky band which is produced into an angle at vein 4.

Underneath much as above but paler and the maculation less distinct.

Female.—Front and thorax chalk white in contradistinction to the yellowish white of *velleda* Stoll, and *lowriei* B. & McD.; abdomen banded with dark and light grey and densely clothed with longish white hairs. Primaries very much paler than the male, and all the veins outlined in white.

In this sex there is a tendency in the dark grey sub-terminal space to become obsolete outwardly from vein 6 to inner margin, thus giving the lower half of the s. t. space the appearance of a narrow, dark band.

Secondaries same as in the male but much paler.

Expanse.—Male 34–35 mm. Female 41–42 mm.

Described from two males and five females all taken on Vancouver Island.

Holotype.—♀, Quamichan Lake, near Duncan, B. C., Sept. 3rd, 1915, G. O. Day, and in the collection of the author, through Mr. Day's kindness.

Allotype.—♂, Sluggett, V. I., Sept. 18th, 1916, W. Downes, and in the collection of the author, through the kindness of the captor.

Paratypes.—One male, Victoria, B. C., Sept. 1st, 1916, taken by the author and in his collection; 3 females, Quamichan Lake, V. I., Sept. 13th, 1906, Sept.

13, 1911, and Sept. 20th, 1914, G. O. Day, and in his collection; 1 female, Sluggett, V. I., Sept. 24th, 1916, W. Downes, and in his collection.

The last-named is somewhat damaged, being broken on inner margin of primaries.

The females vary in depth of colouring on primaries, one of the Quamichan Lake females being very dark, giving the insect a rather slaty-grey appearance.

I take much pleasure in naming this species after my friend Mr. G. O. Day, who has done much good work in describing the life-histories of many of our western species.

The following notes, given to me by Mr. Day, on the egg and cocoon of this species are of interest.

Egg.—"A female found at rest on Sept. 3rd, 1915, extruded 5 eggs when in the killing tin. The eggs were of a dark olive green, joined together end to end, and thinly covered with hairs from the tail of the parent moth. The hairs appeared to be fastened on by the sticky surface of the egg itself—sideways and irregularly. The surface of the eggs were pitted all over. The eggs were evidently infertile as they became concave on one side after a few days."

Cocoon.—"On a former occasion a cocoon was found on an old fence post, a small cavity having been made by the larva and covered by a tough web composed of silk and fragments of excavated wood. The cocoon resembled a blister on the post."

GEOMETRIDÆ.

Eustroma nubilata Pack. form **macdunnoughi,** form. nov.

This form differs from typical *nubilata* in having the ante- and post-median bands and the terminal area on the primaries wholly suffused with dark brown, which is only a degree lighter than the very dark median band. The extra-discal line is faintly shown as a narrow, white line which is more pronounced costally, while the crenulate s. t. line is also picked out in white.

The secondaries in the male have the basal area whitish, shading into dark fuscous from the extra-discal line outwardly, becoming deeper towards the margin, while in the female they are wholly suffused with brown, the suffusion being somewhat paler basally. It flies with typical *nubilata* and although not common, it occurs regularly every season. Named in honour of Dr. J. H. McDunnough, to whom I am deeply indebted for his kindly help and advice in my efforts to straighten out our British Columbia Lepidoptera.

Altar expanse.—Male 30–32 mm. Female 33–36 mm.

Described from 12 specimens, 8 males and 4 females, taken on Vancouver Island and the Lower Fraser Valley.

Holotype.—♂, Rosedale, B. C., June 19th, 1917, taken by the author and in his collection.

Allotype.—♀, Rosedale, B. C., June 23rd, 1917, taken by the author and in his collection.

Paratypes.—4 ♂'s, Goldstream, B. C., May 18th, 1915; Vancouver, B. C., June 18th, 1917; Rosedale, B. C., June 23rd, 27th, 1917, taken by the author and in his collection; 1 ♂, Vancouver, B. C., May 7th, 1905, R. V. Harvey, and now in the author's collection; 1 ♂, Chilliwack, B. C., June 26th, 1918, W. B. Anderson, and in his collection; 1 ♂, Fraser Mills, B. C., July 20th, 1920,

L. E. Marmont, and in his collection; 2 ♀'s, Rosedale, B. C., June 24th, 1917, Cloverdale, B. C., June 15th, 1917, taken by the author and in his collection; 1 ♀, Duncan, B. C., June 28th, 1895, E. M. Skinner, and now in the author's collection.

Dysstroma sobria Swett. form **swetti.,** form. nov.

In the Can. Ent., Feb., 1917, p. 64 et seq., Mr. L. W. Swett gave a paper on the genus *Dysstroma*, in the course of which he described some new abberations, or, as I would prefer to call them, forms of our large Vancouver Island species, which he had at that time identified as *mulleolata* Hulst.

There has been considerable doubt as to what Hulst's *mulleolata* really is, Mr. L. B. Prout, of London, Eng., being the first one, I believe, to associate this large form with *mulleolata* (vide Trans. Lon. Ent. Socy., 1908, p. 38). Drs. Barnes & McDunnough in further notes on this genus (Cont. Lep. No. Amer., Vol. 3, No. 4, March, 1917, p. 228), accepted Mr. Swett's identification of *mulleolata*, although with a certain amount of reserve, as there were several discrepancies between Hulst's type and his description. Later, (ibid., Vol. IV, No. 2, May, 1918, p. 137) on an examination of the type specimen by Dr. McDunnough, the authors came to the conclusion, for reasons which are clearly set forth and which seem exceedingly logical, that Hulst's *mulleolata* is the smaller, white-banded form of *citrata* L, which Mr. Swett had previously called *punctum-notata* Haw. This is the form which in favourable years is very common on Vancouver Island in the month of August.

Accepting Barnes' & McDunnough's identification of *mulleolata* to be correct, (and with which I fully agree) will leave our large, white-banded form without a name. According to the rules of the International Code, the first-named form ,i. e., *sobria*, given by Mr. Swett, will stand for the group collectively, and I propose to give the name *swetti* to the white-banded form, a description of which follows:

Head, front and palpi, cinnamon brown, thorax the same, intermingled with a few lighter hairs. Primaries, basal area dark brown, followed by another white line, slightly sinuous. The central area is white, irregularly bordered with black anteriorly and posteriorly, the posterior portion being wider and more pronounced costally. The amount of white in the central area is somewhat variable, especially between the sexes, the females as a general rule having a much larger proportion of white than the males. The outer border of central area is edged narrowly with white, while contained within the white area is a black linear discal mark. The subterminal area is tawny, shading into dark brown, especially opposite the discal mark, where it appears as a dark diffused blotch. The s. t. line is white, dentate, and rather faint. There is a small, yellowish-white sub-apical mark on the costa. Fringe pale, darker at the termination of the veins.

Secondaries, dark fuscous with the extra-discal line distinctly outlined in a paler shade and being acutely angled between veins 3 and 4. Black discal dots small but distinct.

Underneath primaries dark fuscous with central area showing through darker, a large yellowish patch on costa. Secondaries same colour with extra- and intra-discal lines strongly marked. Discal spots reproduced on all wings

but those on secondaries larger and more prominent. Alar expanse—males, 35–37 mm., females 38–40 mm.+

I take great pleasure in naming this form after Mr. L. W. Swett, who has done a great deal of pioneer work in this group, and to whom I owe much of my present knowledge of the Geometridæ.

Described from five males and five females, all taken by the author at Victoria, B. C.

Holotype.—♂, Victoria, B. C., June 20th, 1914.

Alloiype.—♀, Victoria, B. C., May 22nd, 1915.

Paratypes.—4 males, Victoria, B. C., June 22nd, 1914, June 24th, 1915, July 17th and 22nd, 1920; 4 females, Victoria, B. C., June 16th, 1914, June 24th and 26th, 1915, July 17th, 1920.

Types and paratypes in the collection of the author.

It is easily distinguished from *mulleolata* on account of its larger size, its ruddier appearance, and the shape of the extra-discal line on secondaries. Also by the fact that normally *swetti* flies in June, while *mulleolata* makes its appearance in August.

This year, being an abnormally late year, *swetti* did not apparently emerge until the beginning of July, as the specimens that I took on the 17th and 22nd of that month were a little worn and had been on the wing for at least a couple of weeks.

The list of species in this particular section of the genus *Dysstroma* will now stand as follows:—

Dysstroma
- *citrata* Linn.
  - form *immanata* Haw.
- *mulleolata* Hulst = *punctum-notata* Swett. (nec Haw.).
- *sobria* Swett.
  - form *subumbrata* Swett.
  - form *ochrofuscaria* Swett.
  - form *swetti* Blackmore = *mulleolata* Swett. (nec Hulst).

I do not think that *mulleolata* will prove to be a valid species, but will eventually turn out to be a form of *citrata:* for the present, however, it will be better to leave it as it stands until the life-histories of the various *citrata* forms can be worked out.

Eulype albodecorata, nov. sp.

This new species is very closely allied to *hastata* L., and had perhaps better be described in a comparison with that well-known species.

Palpi, head, thorax and abdomen as in *hastata*. Primaries, basal area black, followed by a narrow white basal line, which is gently curved from costa to inner margin. Sub-basal band black and wider, similarly curved. An irregular ante-median band, white, and about the same width as sub-basal. The broad black median band so characteristic of typical *hastata* is in this species broken up and considerably intermingled with white. Post-median white band rather narrower than in *hastata*, especially costally, with black spots on the veins. The spots vary in number; in some specimens there is a spot on each

vein, while others have spots on only two or three veins. Terminal area and sagittate mark as in *hastata*.

Secondaries.—It is on these that the most striking difference occurs, the large black basal area of *hastata* giving place to a small, dusky basal patch, the rest of the wing, nearly to the outer margin, being clear white, with the exception of a narrow, irregular, broken, black, post-median band which is more pronounced in the holotype than in most of the other specimens. The black outer margin is slightly narrower than in *hastata*. Underneath, all the markings of the upper side are reproduced in detail. Another slight difference which appears fairly constant is in the fringe of the primaries, which in *hastata* is regularly and evenly black and white checkered, but in *albodecorata* it is quite black from the apex to the sagittate mark, below which it becomes as in *hastata*.

Alar expanse 31–34 mm.

Described from 28 specimens, 14 ♂'s and 14 ♀'s taken by the author at Goldstream, B. C.

Holotype.—♂, Goldstream, B. C., June 7th, 1916.

Allotype.—♀, Goldstream, B. C., May 18th, 1915.

Paratypes.—13 ♂'s, Goldstream, B. C., May 8th, 20th, 1915; June 11th, 1913; June 3rd, 1915; June 6th, 7th, 8th, 1916; 13 ♀'s, Goldstream, B. C., May 8th, 1915; June 3rd, 1915; June 6th, 7th, 9th, 1916; July 4th, 6th, 1916.

Types and paratypes in the author's collection.+

At first I thought this new species was a white form of *hastata*, but having had both species under observation for several years, I came to the conclusion that they were distinct.

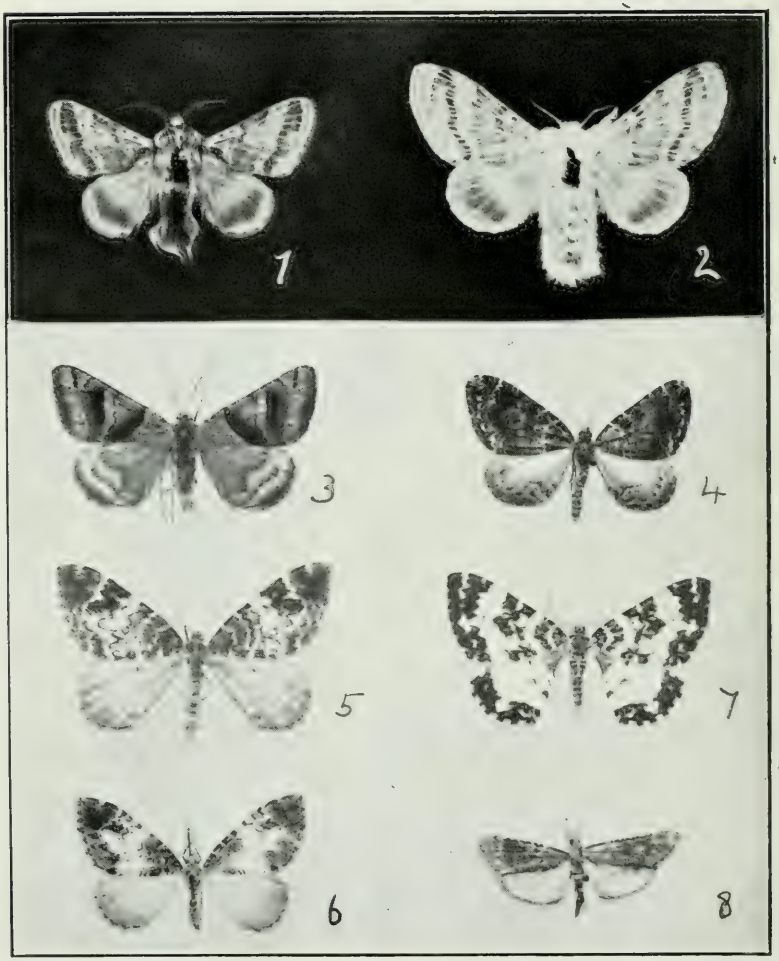
In the first place, *albodecorata* is on the wing from a week to ten days earlier than *hastata*, although the date of appearance depends upon the season. During the years 1915-16 and '17 I gave special attention to the dates of their appearance, and although the season varied in each of those three years (1915 being an especially early year) *hastata* never put in an appearance until the new species had been flying for at least a week. Secondly, although both species are subject to a certain amount of variation within certain limits, I have never known them to intergrade and when one is acquainted with both species, it is comparatively easy to sort them out by their general habitus.

PYRALIDÆ.

Herculia florencealis, nov. sp.

Palpi deep yellow with a few scattered red and black scales exteriorly. Face and head light fawn, thorax a darker shade of same colour. Antennæ fawn, but the scales on each segment are dark tipped, giving them an annulated appearance. Abdomen deep cream colour, each segment ringed with dark brown, posteriorly. Primaries, basal area fawn colour, with a few scattered black scales which are accentuated along the costal region, central area a wide brown band with its interior edge strongly dentate from costa to inner margin; the exterior edge extends obliquely outward from costa to veing b, thence curving gently inward to inner margin and being finely crenate.

On the costal margin of this band are five small sub-quadrate yellow patches. Bordering the wide median band is a narrow yellow streak beginning at costa where it is widest and extending to vein 6 where it becomes obsolete. The



NEW LEPIDOPTERA FROM BRITISH COLUMBIA.

(See p. 266).

terminal area is the same colour as the basal area, with a faint reddish-brown shade running through it. Marginal line dark brown. Fringe dark fuscous.

Secondaries white, overlaid with fuscous scales; a prominent darker curved line runs through the centre of the wing, with another line, less distinct paralleling it exteriorly. Marginal line distinct, dark fuscous. Fringe lighter than primaries with a dark band running through it. Underside, primaries from base to outer fourth, dark fuscous, terminal area lighter with a diffused reddish sub-apical patch and the five yellow sub-quadrate patches showing through on costal margin. Secondaries, light fuscous with the prominent dark line showing through, the second parallel line not being reproduced. Alar expanse 16 mm.

Holotype.— ♀, Rossland, B. C., July, 1900. Taken by the late W. H. Danby, and now in the collection of the author.

I am indebted to Dr. J. McDunnough for the generic determination.

Paratypes of the foregoing new species and forms will be placed as far as they will permit, in the Canadian National Collection, Ottawa, Ont., and the Provincial Museum of Natural History, Victoria, B. C.

Explanation of Plate IX.

1. *Tolype dayi* Blackmore. Allotype, male.
2. *Tolype dayi* Blackmore. Holotype, female.
3. *Caenurgia erechtea parva* Blackmore. Holotype, male.
4. *Eustroma nubilata macdunnoughi* Blackmore. Holotype, male.
5. *Dyssiroma sobria swetti* Blackmore. Holotype, male.
6. *Dysstroma mulleolata* Hulst. With which *swetti* has been misidentified.
7. *Eulype albodecorata* Blackmore. Holotype, male.
8. *Herculia florencealis* Blackmore. Holotype, female.

A SYNOPSIS OF THE ANTHOMYIID GENUS TRICHOPTICUS RONDANI (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

I have placed in this genus all species of the subfamily Phaoniinæ which have setulose hairs on the posterior upper margin of the hind coxæ. The species which have been placed in the genus *Allœostylus* Schnabl differ in habitus and hypopygial structure from those which belong strictly to *Trichopticus*, but I have included them here because the females are so similar to those of the true species of this genus that there is nothing to be gained by separating them, the more so as they are similar in habitat, all species being found in the north or in mountainous country. I have not seen any species of the genus as here

defined from the southern United States, Central or South America, Africa, Australia or any part of Asia, though there is a likelihood of their occurrence in Tibet.

Key to Species.

MALES.

1. Hind tibia with a strong fasciculate apical thorn on ventral side.....2.

   Hind tibia without such thorn, sometimes with one or two bristles.....3.

2. Yellow species of robust habitus.....*diaphanus* Wiedemann.

   Black species of slender habitus.....*coquilletti* Malloch.

3. Legs largely or entirely yellow; hind tibia with setulose hairs and a few long bristles; thorax with two pairs of strong presutural acrostichals....4.

   Legs entirely black; hind tibia usually with long, soft hairs in addition to a few hairlike bristles.....5.

4. Hind femur stout and straight, with rather long dense hairs on posterior and posteroventral surfaces; antennæ black; mid tibia with one or two anterodorsal bristles.....*conformis* Malloch.

   Hind femur slender, curved, with a few posteroventral bristles on apical third; base of third antennal segment rufous; mid tibia without anterodorsal bristles.....*latipennis* Malloch.

5. Abdomen with paired dorsal spots; hind tibia without posterodorsal bristles; thorax with three pairs of postsutural dorsocentral bristles.....*maculiventris* Malloch.

   Abdomen without paired dorsal spots; hind tibia with one or more posterodorsal bristles.....6.

6. Fore tibia with several strong spines on posteroventral surface near apex..7

   Fore tibia without spinose armature as above, sometimes with a few hairlike bristles.....10.

7. Fore tibial spines four in number, in a single series; mid tarsus without a fringe of fine hairs on apical three segments.....*fimbriatus* Coquillett.

   Fore tibia with the spines in two vertical series; mid tarsus with a fringe of fine hairs on posteroventral edge of the apical three segments.....8.

8. Fore tibia with three spines; mid tarsus long and slender, fourth segment at least twice as long as wide.....9.

   Fore tibia with four spines; mid tarsus short and stout, fourth segment as wide as long.....*septentrionalis* Stein.

9. Halteres yellow; mid femur with a number of long hairs on basal half of posteroventral surface.....*diffinis* Malloch.

   Halteres black or brown; mid femur without such hairs.....*spiniger* Stein.

10. Thorax with three pairs of postsutural dorsocentral bristles; mid tibia with one or two bristles on anteroventral and posteroventral surfaces ..... *melanderi* Malloch.

Thorax with four pairs of postsutural dorsocentral bristles ..... 11.

11. Halteres and calyptræ yellow; mid femur with a conspicuous group of dense, stiff, obtusely pointed bristles on apical third of anteroventral and ventral surfaces, and a series of about 8 very long, strong bristles extending from base to beyond middle of posteroventral surface ..... *johnsoni* Malloch.

Halteres black or dark brown, calyptræ whitish; mid femur not armed as above ..... 12.

12. Second, third and fourth segments of mid tarsus with a fringe of very fine hairs along posteroventral margin; mouth-margin very much produced; arista with very short pubescence; hind tibia with a series of erect setulose hairs on anterodorsal surface, one or two of which are longer than the others, the hairs of entire series at least as long as the diameter of tibia ..... *subrostratus* Zetterstedt.

Mid tarsus without hairs as above; mouth-margin not produced ..... 13.

13. Hind tibia without strong bristles on anterodorsal surface, the hairlike bristles on anteroventral surface much longer than the posterodorsal bristles, which number from five to seven; fore tibia with dense, moderately long hairs on ventral surfaces; mid tibia with a number of bristly hairs of irregular lengths on apical half of ventral surface ..... *villicrurus* Coquillett.

Hind tibia with two long bristles on anterodorsal surface, the anteroventral bristles not longer than those on the posterodorsal surface ..... 14.

14. Mid tarsus distinctly shorter than mid tibia; longest hairs on arista about twice as long as its basal diameter; abdomen with a broad black triangle on dorsal segments 2 and 3; preapical dorsal bristle on hind tibia strong ..... *breviarsis* Malloch.

Mid tarsus distinctly longer than mid tibia; longest hairs on arista about as long as its basal diameter; abdomen with the black dorsal marks on segments 2 and 3 nearly linear; preapical dorsal bristle on hind tibia weak or absent ..... *innocuus* Zetterstedt.

FEMALES.

1. Thorax and abdomen yellow ..... *diaphanus* Wiedemann.

Thorax and abdomen black ..... 2.

2. Abdomen with paired dorsal spots; hind tibia without posterodorsal bristles; thorax with three pairs of postsutural dorsocentral bristles ..... *maculiventris* Malloch.

Abdomen without paired dorsal spots ..... 3.

3. Legs largely or entirely reddish or yellowish.....4.

   Legs entirely black.....5.

4. Thorax with two pairs of strong presutural acrostichal bristles; mid tibia with one or two anterodorsal, and two posteroventral bristles besides the posterodorsals.....*conformis* Malloch.

   Thorax with two pairs of weak presutural acrostichal bristles; mid tibia without anterodorsal and posteroventral bristles.....*latipennis* Malloch.

5. Thorax with three pairs of postsutural dorsocentral bristles.....6.
   Thorax with four pairs of postsutural dorsocentral bristles.....7.

6. Mid tibia with an anteroventral and a posteroventral bristle.....*melanderi* Malloch .

   Mid tibia without an anteroventral and a posteroventral bristle.....sp.?

7. Glossy black species, thoracic dorsum with lateral margins and a narrowly divided central vitta white pruinescent; arista almost bare; hind tibia with two bristles on posterodorsal surface, the larger one apicad of the smaller, situated at or just beyond middle of tibia; lower margin of cheek gently curved in outline, with a very strong, upwardly curved bristle before middle in addition to the other marginal bristles.....*johnsoni* Malloch.

   Species not glossy black, at least the thorax with dense, uniform grayish pruinescence; bristles on hind tibia not as stated above.....8.

8. Hind tibia with one posterodorsal bristle about one-third of the tibial length from apex, anterodorsal surface with two bristles; face almost vertical in profile, the mouth-margin but little produced, almost in vertical line with base of antenna; margin of cheek with a few bristly hairs, one or two of which, near anterior margin, are upwardly directed; halteres yellow.....*innocuus* Zetterstedt.

   Hind tibia with two or more posterodorsal bristles.....9.

9. Halteres black; mouth-margin very much produced anteriorly, projecting very much beyond the vertical line of base of antenna; base of wings not yellowish; abdomen not densely pruinescent..*subrostratus* Zetterstedt.

   Halteres yellow; mouth-margin not much produced anteriorly, hardly projecting beyond the vertical line of base of antenna; wings yellowish at bases; abdomen very densely pruinescent.....10.

10. Fore tibia with a strong bristle near apex on posteroventral surface.....*septentrionalis* Stein.

    Fore tibia without such bristle.....*spiniger* Stein.

N. B.—Holmgren's species *frenatus* which has been placed in Lasiops or Trichopticus by authors belongs, according to my interpretation of generic limits, to Phaonia.

THE NERVOUS SYSTEM OF THE LARVA OF *STHENOPIS THULE* STRECKER.

BY J. M. SWAINE,
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The Nervous System of insects is usually treated under two divisions, the Central System and the Sympathetic System. The two are so very intimately connected in the caterpillars of the Lepidoptera that there would appear to be little reason for separating them.

The Central System.

There are included here the cerebral ganglia and their commissures, with the continuing ventral chain of ganglia and connectives, together with the chief nerves to which they give rise.

The supraoesophageal ganglion, or brain, lies within the head upon the dorsal wall of the pharynx; it is connected by the crura cerebri, stout connectives which pass around the pharynx, to the suboesophageal ganglion lying immediately below the fore-intestine. The nerves arising from these two cerebral ganglia furnish practically all the nerve supply to the head.

The suboesophageal ganglion forms the first of a single chain of ganglia and connectives lying upon the ventral muscles along the median line. There is one ganglion in each thoracic segment and one in each of the first eight abdominal segments. The ganglia are jointed together by connectives, the whole forming a single median chain. The primitive double connectives have been completely fused into a single stout cord throughout the entire length of the chain: even in the thorax, where all caterpillars outside the Jugatæ have double connectives, they are as firmly fused as in the abdomen. The only indication of the primitive double nature of the cord is shown in the slight longitudinal split in the connective immediately in front of each ganglion, from which the median nerve arises. The fusion of the connectives in the thorax is a most interesting character, the more so since it appears in conjunction with the presence of a distinct eighth abdominal ganglion.

Most caterpillars have only seven abdominal ganglia, with the last more or less evidently composite. In *thule* and *argenteomaculatus* the eighth ganglion, composite in itself, is separated from the seventh by a connective nearly as long as that between the seventh and the sixth ganglia.

Each ganglion of the ventral chain lying behind the suboesophageal gives to its segment typically two pairs of nerves. The anterior pair evidently represent the primitive lateral nerves of the connectives, which in this group have migrated backwards until they appear now as the nerves from the ganglia. The nerves of the last ganglion, three pairs in all, are discussed below.

The Brain.

Pl. X, Fig. 8.

The Brain, or the Supraœsophageal Ganglion, is situated on the meson a little behind the middle of the head and well below the dorsal wall. It is very distinctly bilobed, rounded before and behind, and towards the front extended latero-ventrad to the nerves and the crura. The median line is deeply impressed so that the appearance is decidedly that of two ganglia united along the middle line.

The optic, antennal, and fronto-labral nerves arise close together on each side from the cephalo-lateral extension in front of the commissures.

The Optic Nerve, Opt., Fig. 8, is closely connected with the other two at the base and often with the antennal for a considerable distance. It runs cephalad and laterad, curving behind the dorsal condyle of the mandible and ends abruptly on the hypoderm below the cluster of eyes. From its extremity on or in the hypoderm fine branches proceed to the individual eyes. The Optic is usually closely connected for a portion of its length with the cephalic nerve of the lateral sympathetic.

The Antennal Nerve, Ant., Fig. 8, frequently appears firmly united at its base with the fronto-labral, giving the latter the appearance of a three-branched nerve; in other specimens it can be distinctly traced backward to the ganglion. It extends cephalad and lateral with the optic, curves sharply caudad and ventrad behind the dorsal condyle of the mandible and enters the base of the antenna, giving nerve-threads to the nerve-like antennal muscles on its way as well as to neighbouring setae. It sometimes lies immediately behind the optic for a considerable part of its length, crossing below the latter beyond the mandibular condyle on its way to the antenna.

The Fronto-labral Nerve, Fig. 8, arises, as already stated, in close conjunction with the antennal and optic. It proceeds directly cephalad along the side of the oesophagus, or pharynx, and presently divides into two main branches. The mesal division, or sympathetic branch, curves regularly to the frontal ganglion upon the meson, and may be considered a part of the sympathetic. It has no branches. The lateral division, or the labral nerve proper, extends directly cephalad to innervate muscles of the pharynx and labrum, and to give certain fibres to the sympathetic. Slightly cephalad of the frontal ganglion it becomes considerably widened and gives off several branches. One passes dorso-mesad to retractor muscles of the pharynx; a slender unbranched strand, "S.br.2", connects the labral nerve with the cephalic ganglion, "c.ge.", of the median nerve; a stouter mesal branch, "m.br.", runs cephalad along the side of the pharynx and enters the labrum; a fourth branch, "ph.br.", passes to the lower part of the side of pharynx and immediately divides into three main branches which innervate that region. The mesal branch of these is directly connected with a ganglion of a sympathetic plexus, "s. gl.," lying upon the hypoderm of the wall of the mouth, and is through the branches of this plexus connected with the cephalic branches of the median nerve. The main division of the labral nerve, L., innervates the labral muscles, as indicated on the figures. The outermost branch runs cephalo-laterad in conjunction with the mandibular nerve of that side, but curves sharply mesad at its tip, giving numerous strands to the lateral muscles of the labrum. The details of its branching are shown on the figures. The two connections with the sympathetic vary considerably in different individuals. In one specimen these two sympathetic connections seemed to be united, one strand from the labral nerve uniting with the plexus, which in turn was connected with the cephalic ganglion.

The optic, antennal and fronto-labral nerves are variably fused at the base; in some individuals the three are united for a third their length, so that one enormous nerve leaves the brain on each side.

On one specimen, extremely delicate fibres were distinguished running from the ventral face of the brain to the heart immediately below. There were three, one in the middle and one on each side. Whether these are of nervous or connective nature I am unable to say.

The brain is abundantly supplied with tracheoles from neighbouring tracheae.

The Suboesophageal Ganglion.

Pl. X, Fig. 9.

The Suboesophageal or Infraoesophageal Ganglion is a large, flattened, somewhat quadrate ganglion, lying in the caudal part of the ventral portion of the head. It is connected with the supraœsophageal ganglion by the Crura Cerebri, as already described, and, by a very short commissure, is connected with the first thoracic ganglion, thus becoming the cephalic ganglion of the ventral chain.

It gives origin to four pairs of nerves. The first three pairs arise from the cephalic part of the ganglion, at the sides, mesad of the ventral origin of the commissures.

The Mandibular Nerves, Fig. 9. The most anterior pair, the Mandibular Nerves, extend cephalad, more or less parallel with the other two pairs, though usually lateral to them, as far as the ventral condyle of the mandibles. They then turn abruptly and proceed almost directly to the dorsal side of the mandibles in rather close relation with the external branch of the labral. Before reaching the mandible each mandibular nerve bifurcates, the two divisions running nearly parallel to each other. At the entrance to the mandible the cephalic branch enters the mandibular ganglion, which innervates the interior of the mandible, and certain of the mandibular muscles, particularly the retractors (see Fig. 1); while the caudal division proceeds laterad above the ventral condyle and divides into a dorsal and ventral branch. The position of these branches is explained on Fig. 1. The ventral branch extends to the base of the head to innervate various muscles of that region.

A delicate branch from the mandibular nerve fuses on the middle line with its fellow from the opposite side, and the two are continued cephalad as a median strand into the hypopharynx, which it innervates. Before reaching the median nerve each of these branches from the mandibular gives rise to a slender thread which joins the plexus of minute threads lying upon the hypoderm below the mouth.

The Maxillary Nerves, Fig. 9. The second pair, the Maxillary Nerves, extend cephalad nearly parallel with the labial, and bend laterad behind the union of the silk glands to innervate the muscles and sense organs of the maxillae.

The Labial Nerves, Fig. 9. The third pair, the Labial Nerves, proceed cephalad along the sides of the oesophagus and pharynx to innervate the region of the labium. They seem clearly to innervate muscles and glands and to be directly connected with the cutaneous sympathetic; the branches are illustrated in the figures. On some specimens there is an unbranched connective uniting the labial nerves behind the fusion of the silk glands.

Near the union of the silk glands each labial nerve gives a short, thickened branch to the median line. The two branches unite in an elongate ganglion,

"M. g.", bifurcating cephalad, which lies upon and innervates the glandular area of the outer part of the mentum.

The Ventral Nerve of the subesophageal ganglion passes to a lateral ganglion lying in front of the first spiracle, which in turn innervates the muscles of that region and sends two strands to the silk gland of its side. The ganglion is connected with a nerve plexus lying among the main tracheal branches, interwoven with a string of gland-like cells, oenocytes, and many tracheal threads. This plexus is in turn connected with the cephalic branch of the bracheal nerve.

The Commissures.

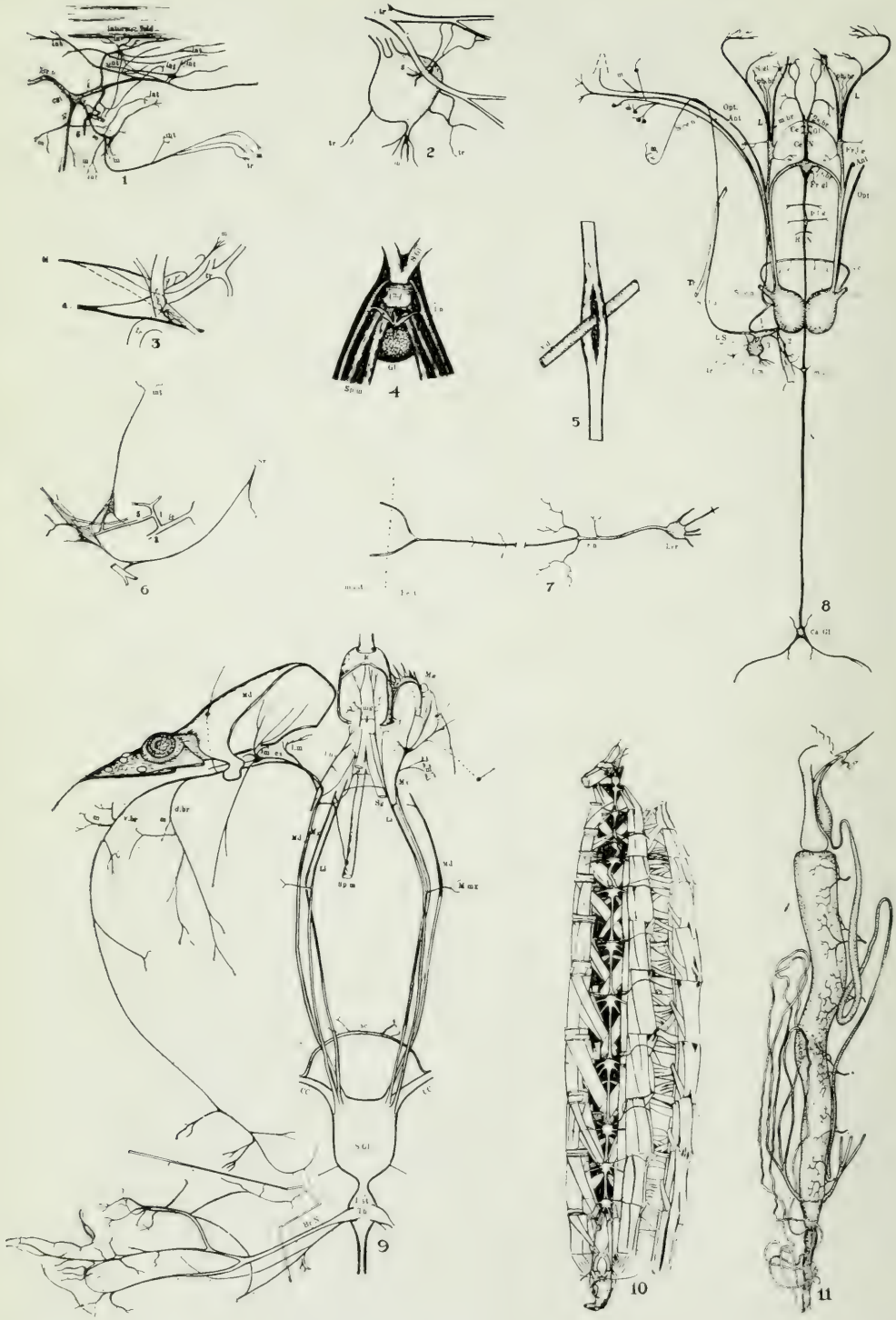
The Suboesophageal Commissure arises from the brain in conjunction with the Crura Cerebri. It soon separates from the latter and passing ventrad and somewhat cephalad forms a complete loop around the oesophagus. Near the middle line below the oesophagus it gives two or more pairs of delicate fibres to pharyngeal muscles. It is a rather stout cord and must have some function other than these small branches would indicate. It assists greatly in holding the brain in position and that is probably its chief use.

The Crura Cerebri proceed from each side of the brain downward and backward to connect with the suboesophageal ganglion below the oesophagus. They are unbranched.

The First Thoracic Ganglion, Pl. X, Fig. 9; Pl. XI, Fig. 2, gives rise to two pairs nerves. The smaller, superficial pair, "A," Pl. XI, Fig. 2, probably represent the nerves of the connectives between this ganglion and the suboesophageal ganglion; they innervate chiefly the superficial muscles, with threads to the hypoderm, passing across the tracheae eventually to the dorsal muscles and integument. The second pair, the Brachial Nerves, "B", divide each into a cephalic and a caudal division. The former innervates muscles in the base of the head, by the recurrent branch, and the anterior part of the prothoracic segment. and is connected with the superficial nerve. An important branch, "5", from the base of the cephalic division passes into the leg. The posterior division gives a branch, "3", innervating numerous muscles, and then, "4", passes directly into the leg.

The Third Thoracic Ganglion. The arrangement of the nerves from the second and third thoracic ganglia are illustrated in Pl. XI, Fig. 5. The Superficial Nerve, "A", passes outward beneath the recti muscles giving many branches to muscles, tracheae and integument. It has two or three connections with the anterior branch of the median nerve of its side. The Brachial Nerve, "B", passes directly to the base of the leg and there gives three branches from a more or less distinct coxal ganglion. The cephalic division, "1", innervates deep muscles and the integument, giving a stout strand, "5", to the leg. The remaining two branches "3" and "4 ", represent the caudal division described for the first thoracic ganglion. Nerve "3" goes to muscles and integument of the caudal part of the segment, and nerve "4" goes to the leg. Nerves "1" and "3" lie below nerve "A".

The First Abdominal Ganglion, Pl. XI, Fig. 6. This ganglion gives rise to two pairs of nerves; the anterior, "A", evidently represents the primitive lateral nerve of the connective which has migrated caudad and become fused with the degenerate brachial nerve, and the posterior, "C", is possibly the posterior



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division of the median nerve which has fused with the ganglion. Nerve "A" is the chief nerve of the segment. It passes beneath the major recti muscles, giving off a minor, posterior division, "D", and extends across the tracheae to dorsum, innervating muscles, tracheae and integument. It has several connections with the median nerve. Nerve "C" passes backward to unite with a branch from the median nerve of the second abdominal segment, and gives off three main branches, chiefly to the integument. In the segments having prolegs a branch to the proleg of that side is given off from nerve "C" at the point marked "x" on figure 6 of the 2nd ganglion.

The Eighth Abdominal Ganglion, Pl. XI, Fig. 4, possibly represents the united 8th and 9th primitive ganglia. The median nerve is found as usual. The first pair, A, are of the normal type, representing the nerves of the primitive connectives and belonging to the 8th ganglion; the pair, "C", probably represent the second pair of the 8th ganglion. They innervate many muscles and the hypoderm of the 8th segment. The last pair, "D", stouter than the others, go to the last two segments of the caterpillar and to the caudal end of the intestine. They give off numerous branches to all the organs of that region, presenting two large ganglia of varying shape in different individuals.

There is little doubt, from the number of its nerves and its position, that the eighth ganglion in *thule* is composed of the united eighth and ninth primitive ganglia. Nerves "A" and "C" evidently belong to the primitive eighth ganglion, and nerve "D" would, therefore, represent the fusion of those of the ninth ganglion. That "D" is a composite nerve has been suggested by DuPorte and it seems probable from its size, extensive branching, and the passage of the vas deferens through it. This last peculiar condition was described by DuPorte in *Sphida obliqua*. It occurs also in *thule* but apparently not invariably, since I was unable to demonstrate it in several specimens. In *thule* the vas deferens normally passes at right angles directly through the middle of a chief branch of the nerve between the two main lateral ganglia. This condition would apparently be explained best as resulting from a fusion of the two nerves or two branches of the same primitive nerve. The median nerve of the ninth ganglion has disappeared or fused with "D".

The Sympathetic System.

The so-called sympathetic system of insects is usually divided into two or three groups of nerves and ganglia, all of which are very intimately connected with the central system. These are, the Supraintestinal Sympathetic System, comprising the Unpaired Median and the Paired Lateral groups of nerves and ganglia; and the Subintestinal Sympathetic System, or Paired Median Section, comprising the Median Nerves of the ventral chain. In addition to these there is a very delicate network of minute nerve threads and ganglia lying upon the hypoderm, and connected through numerous fine threads with the Central System as well as with the three divisions of the Sympathetic. This has been referred to as the Peripheral or Sensory Sympathetic System.

The Unpaired Median Section.

Pl. X, Fig. 8.

This minor group lies upon the dorsal face of the fore intestine to which its fibres mainly go. It comprises the Frontal Ganglion and the Cephalic and

Recurrent Nerves. The Frontal Ganglion lies upon the middle line of the fore-intestine well in front of the brain. It receives on each side the large sympathetic branches of the fronto-labral, called the Arched Nerves, and gives rise to the Cephalic Nerve in front, and to the Recurrent Nerve behind. The Cephalic Nerve passes directly forward along the middle line of the intestine to the base of the clypeus; here it enlarges to form the Cephalic Ganglion which gives two pairs of nerves to the intestine and receives on each side a slender thread, the Minor Arched Nerves, or the second sympathetic branch from the fronto-labral nerve. The frontal nerve bifurcates at the anterior end of the cephalic ganglion and each branch gives many threads to the muscles of that region. One of these threads is connected through a minute ganglion of the peripheral sympathetic system with a slender branch from the fronto-labral ganglion.

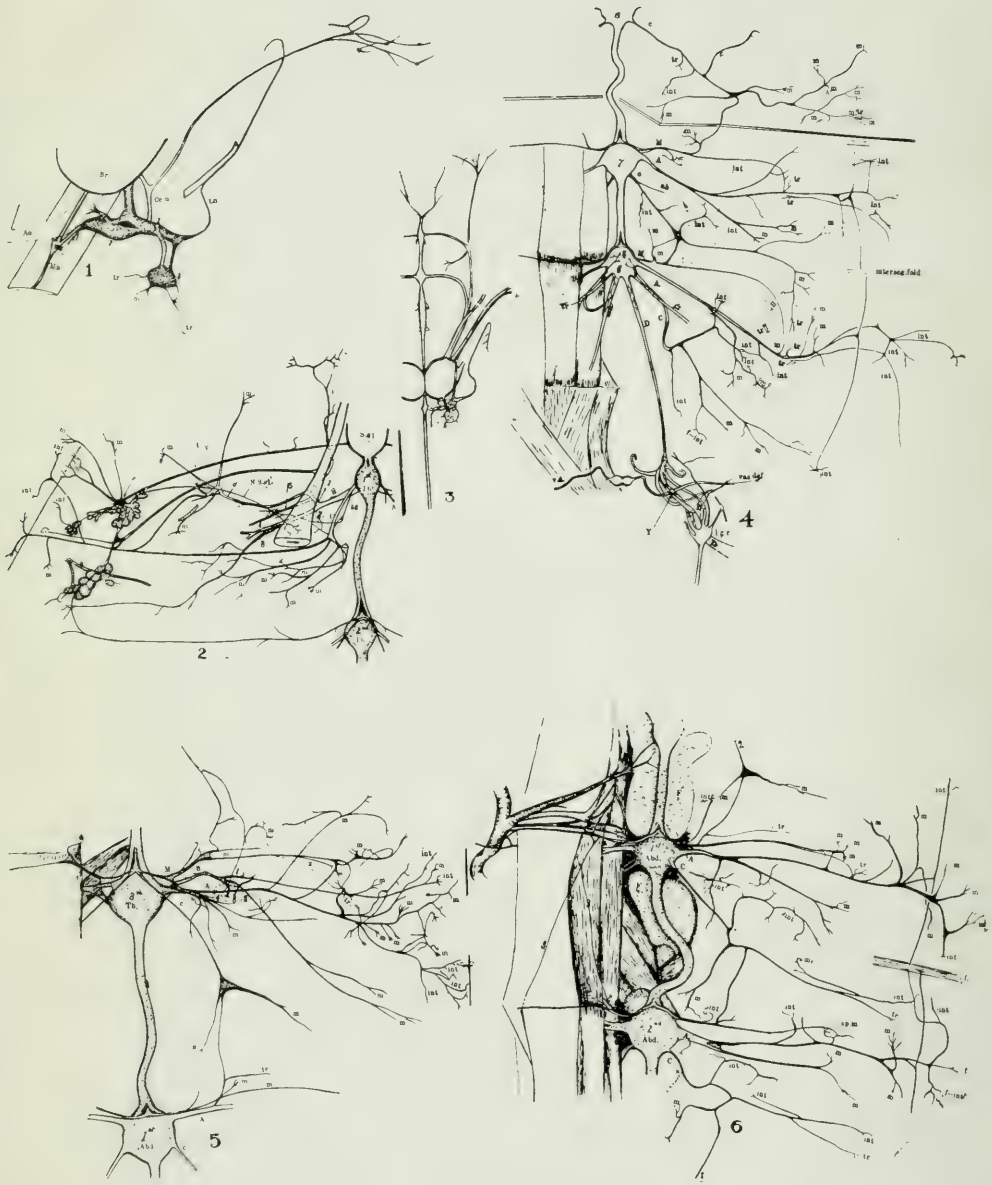
The Recurrent Nerve passes backward from the frontal ganglion as a slender strand along the median line of the intestine, beneath the heart and brain, and expands into a Caudal or Stomachic Ganglion at the base of the oesophagus. From the caudal ganglion several filaments arise as well as two larger nerves which were traced for a short distance one along each side the mid intestine. Nearly midway between the frontal ganglion and the brain the recurrent nerve expands into an elongate ganglion which gives three pairs of lateral nerves to the fore-intestine. A short distance behind the brain the nerve again enlarges slightly, forming a minute Median or Hypocerebral Ganglion connected by a delicate thread with the second ganglion of the paired lateral group. Along its course the recurrent nerve innervates the fore and midintestine, and certain delicate threads were noticed to enter the wall of the heart.

The Paired Lateral Section.

Pl. X, Figs. 2 and 8; Pl. XI, Figs. 1 and 3.

The arrangement of this plexus of ganglia and nerves varies considerably in different specimens. Usually there is found a short nerve arising from the side of the caudal part of each half of the brain. This nerve enlarges directly to form a fusiform ganglion, "1", Pl. X, Fig. 8, which gives rise by short nerves to two others. One of these, "2", fusiform in shape, innervates that part of the intestine immediately behind the brain, sends fibres to the heart, and one to the cephalic ganglion of the median nerve. This ganglion sometimes arises directly from the brain by a separate commissure, but is always closely connected with the first ganglion. The third ganglion, "3", of this lateral sympathetic section is nearly circular, flattened, and connected with the first ganglion by two short nerves; it supplies the fan-shaped muscles of the oesophagus and the neighbouring tracheae. What I have called the first ganglion is sometimes but little enlarged and then appears more like a stout nerve, but as a rule there are three distinct ganglia. The first ganglion, besides apparently giving delicate threads to the tracheae with which it is always in close contact, gives off two very interesting nerves, the Sensory and the Lateral Nerves.

The Sensory Nerve passes from the cephalic face of the ganglion cephalad past the brain, to which it is joined by a short connective, and is continued latero-cephalad in close connection with the optic nerve, which it finally leaves, and



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bifurcates to innervate various setae on the laterodorsal wall of the head. The second, the lateral Nerve, arises from the outer end of the first ganglion and passes laterad and then cephalad, in close connection with a tracheal branch, bending ventrad and innervating certain muscles at their attachment to the ventral wall. In *argenteomaculatus* larvæ, Pl. XI, Fig. 3, the arrangement of this group is closely similar to that just described, but there are, as in many other parts of the nervous system, constant differences. An instance of this occurs in connection with the third ganglion, which has there a direct connection with the caudal part of the brain.

A tracheole crosses the inner face of the 3rd lateral ganglion in *thule* and extends into minute tracheoles which mainly supply the lateral fan-like muscles of the oesophagus, innervated by the 2nd ganglion.

Crossing this tracheole, and extending from the caudal part of the inner face of the 3rd ganglion, is a minute rather elongate ganglion giving threads to the tracheoles entering the brain, Pl. X, Fig. 2.

The Paired Median Section.

This consists of the so-called Median Nerves of the central system, with their branches, and there seems to be little reason for treating it as separate from the ventral chain. The Median Nerve appears in front of each ganglion of the ventral chain as a very short, subtriangular nerve arising from the connective in the median split immediately in front of the ganglion. In the abdomen each median nerve divides into two transverse nerves which proceed outward at right angles to the vetral chain. Their distribution is shown in Pl. XI, Figs. 2, 4, 5 and 6. A cephalic branch connects with a branch of the posterior nerve of the preceding segment; a basal thread goes to the integument, and the distal portion of the nerve innervates the spiracular muscles in addition to giving one or more connections to the anterior nerve of its segment. The median nerve of the eighth ganglion, which should appear in front of the ninth if that ganglion were separate, has apparently disappeared.

The median nerves in front of the second and third thoracic ganglia give off each two pairs of transverse nerves. The second or posterior pair are really oblique in position and pass latero-caudad, eventually uniting with the median nerve of the succeeding segment. It has already been suggested that the posterior nerves of the abdominal ganglia represent these posterior branches of the thoracic median nerves, which have become fused with the ganglia and lost their original connections. The median nerve in front of the first thoracic ganglion is apparently not always present, but has been demonstrated on some specimens of both *thule* and *argenteomaculatus*. It is simple with very few fine branches and passes cephalad and ventrad to muscles at the base of the mandibles. It is possible that the minute branch, Fig. 2, "sy", represents the caudal branch of the median nerve which has degenerated and become fused with the base of the superficial nerve.

Explanation of Plate.

Plate X.

Figure 1, *S. thule*, larva,—Distribution of the brachial nerve of the 1st thoracic segment. c.gl., coxal ganglion; other lettering as on Plate XI, fig. 2.

Figure 2, *S. thule*, larva,—The under surface of the 3rd sympathetic ganglion, showing a slender attached ganglion, g.

Figure 3, *S. thule*, larva,—Distribution of branches from the median and superficial nerves of the 2nd thoracic segment to the main tracheae.

Figure 4, *S. thule*, larva,—Distribution of the labial nerve at the junction of the silk glands, a and b, ganglia arising from the labial nerve, l.n.; S. Gl., silk glands reverted; Gl., a median gland lying below the silk gland; Sp.m., muscles from the spinneret.

Figure 5, *Eacles imperialis*, larva,—The vas deferens passing through a branch of the additional nerve of the 8th segment.

Figure 6, *S. thule*, larva,—The relation of the brachial nerve of the 3rd thoracic segment with the peripheral sympathetic plexus.

Figure 7, *S. thule*, larva,—A portion of the rectal nerve arising from the lateral ganglion of the rectum, l.g.r.

Figure 8, *S. thule*, larva,—Dorsal view of brain, or supraœsophageal ganglion and its Nerves. Ant., antennal nerve; Ca. Gl., caudal ganglion; c. c., crura cerebri; Ce. Gl., cephalic ganglion; Ce. N., cephalic nerve; Fr. gl., frontal ganglion; Fr. l.g., frontal ganglion of the labral nerve; l., labral nerve; m. br., mesal branch; L. S., lateral symathetic; 1, 2, 3, its ganglia; S. ce.n., its cephalic nerve; S. l. n., its lateral nerve; m., fibres to muscles; m.gl., mesal ganglion; phbr., pharyngeal threads; p.f.g., post frontal ganglion; R.N., recurrent nerve; s. br., sympathetic branches of the labral nerve, 1 and 2; S.gl., sympathetic ganglion; tr., threads to brancheoles; Tr., a tracheal; Opt., optic nerve.

Figure 9, *S. thule*, larva,—Ventral view of the subœsophageal ganglion and its nerves. Br. N., brachial nerve; CC. crura cerebri; Li., labial nerve; l. m., l.n., strands from labral nerve; Md., mandible, and mandibular nerve; m.ex., external branch, d.br., dorsal branch, v.br., ventral branch; Mx., maxilla and maxillary nerve; s.c., subœsophageal commissure; s.gl., subœsophageal ganglion; S.g. silk gland; sp.m., muscle of spinneret; 1st Th., 1st thoracic ganglion; m., nerve fibres to muscles; mg., mesal ganglion of labial nerves.

Figure 10, *S. thule*, larva,—A general view of the nervous system.

Figure 11, *S. thule*, larva,—The alimentary canal, showing the silk gland of one side and the malpighian tubes of one side.

Plate XI.

Figure 1, *S. thule*, larva,—The lateral sympathetic system, dorsal view. 1, 2 and 3, the three chief ganglia; Ao., aorta; Br., brain; Ce. n., cephalic nerve; L.n., lateral nerve; M. g. mesal ganglion; M.n., mesal nerve.

Figure 2, *S. thule*, larva,—Nerves from the first thoracic ganglion, (1st Th.) A., superficial nerve of the segment: B., brachial nerve, with divisions 1, 2, 3, 4 and 5; d., dorsal branch of B.1; g., lateral ganglion of ventral nerve; int., to the integument; M., to muscles; N.S. gl., nerve to silk gland; Y., recurrent branch of B.1; S., silk gland; S.gl., subœsophageal ganglion; V.N., ventral nerve.

Figure 3, *S. argenteomaculatus*, larva.—Details of the lateral sympathetic.

Figure 4, *S. thule*, larva.—The 7th and 8th abdominal Ganglia. D., the additional nerve of the 8th ganglion, representing the nerves of the 9th ganglion; l.g.r., lateral ganglion of the rectum; y., the vas deferens passing through a branch of D.; other lettering as before, see, Pl. 1, fig. 5; V. d., vas deferens.

Figure 5, *S. thule*, larva.—Nerves from the third thoracic ganglion; M., median nerve; c., caudal branch of median nerve; X., and additional thread present on the opposite side of the segment only; other lettering as in Fig. 2.

Figure 6, *S. thule*, larva.—Nerves from the first and second abdominal ganglia. Abd., 1st and 2nd., first and second abdominal ganglia; C., caudal nerve of the ganglion; Cx. branch to the proleg; F., fat body; F. nerve fibres to fat body; int., to the integument; m., to muscles; tr., to tracheae; i.f., intersegmental fold; A, superficial nerve.

(To be continued.)

BOOK REVIEW.

Manual of the Orthoptera of New England, Including the Locusts, Grasshoppers, Crickets and their Allies. By Albert P. Morse. Proceedings of the Boston Society of Natural History. vol. 35, No. 6, pp. 197-556, pls. 10-29, 99 text figs. April, 1920.

Even a casual inspection of this Manual leaves the impression of a work of rare quality, and a careful perusal of it only confirms and emphasizes this first impression, every page revealing the author's intimate knowledge of his subject. It is characterized not only by scientific accuracy and scholarship, but also by an attractive literary style, and is undoubtedly one of the best faunistic treatises on a group of American insects that has ever appeared.

Mr. Morse's book is the outgrowth of many years of research in field and laboratory, as everyone knows who is acquainted with his many excellent papers on the New England Orthoptera. It is by no means a mere systematic treatise, but covers a wide field, in which many matters of general biological interest are discussed.

In the introductory matter, which covers 76 pages, the author gives an interesting sketch of New England Orthopterology, an account of the principal collections of New England Orthoptera, and sections on the anatomy, habits, coloration, distribution and many other matters concerning the biology of the order. He also describes the injuries caused by locusts and other Orthoptera and the methods employed for their control, and concludes this part of the book with a very useful section giving full directions for the collection and preservation of specimens.

The general account of the habits of Orthoptera is based on those of the locusts, or short-horned grasshoppers, and is followed by a delightful description of the songs of grasshoppers and crickets and the methods by which they are produced. The next section on coloration contains much of interest. The three types of insect coloration, structural, pigmental and combinations of these, are all illustrated by species of this order, the majority being of the pigmental type. Many interesting examples of sympathetic or protective coloration are given, while the non-sympathetic coloration seen in the brightly coloured wings of the Oedipodinae, is regarded as being due, not to the phenomenon of "contrast mimicry" but as a means of signalling to other individuals of the community. Dichromatism and the varied coloration of certain species, such as the Carolina Locust, are considered to be independent of environmental coloration. The dichromatism of the Green-striped Locust is discussed in a special section by Dr. Phineas W. Whiting, who performed a series of experiments which seemed to show that temperature, and not humidity nor light, is the important factor in the colour determination of this species.

The sections entitled "Geographical Distribution" and "Colonization of New England—Dispersal Routes" are particularly excellent. In the former various faunal zones are characterized and their boundaries within the New England States clearly defined, and the characteristic species of Orthoptera inhabiting each are enumerated. Local distribution is also discussed and the author's well-known classification of locust habitats is introduced in illustration of this subject. Following this section is one on "Wingless and Vestigial-winged Orthoptera," in which the author's views on wing-length as a habitat relation are quoted from a former publication (Publ. 18, Carnegie Inst. Wash.).

The economic aspect of the subject is treated at considerable length in three sections dealing with the injuries of locusts and other Orthoptera in New England, remedies against locusts and earwigs, and natural enemies, including bacterial and fungus diseases, parasites, such as hair-worms, mites and tachinid flies, predaceous insects, amphibians, snakes and birds. Remedies against cockroaches are dealt with under the general account of the Blattidae in the special part of the volume.

In this second part, which deals with the classification and description of the various species, the same high standard of excellence is maintained, and the descriptive matter is relieved of the dryness usually characteristic of systematic works by the many vivid word-pictures of the habits and environmental relations of the different species. The author is wisely conservative in following a system of classification that has long been in general use, and in introducing

no changes of nomenclature. The placing of the family Phasmidae, a very isolated group, between the nearly related families Blattidae and Mantidae is the only point we would criticise in this connection, but the matter is of little consequence in a work of this character.

Of the 132 species of Dermaptera and Orthoptera recorded from New England no less than 28 species are introduced forms, among which are 5 species of earwigs, 14 of cockroaches, 3 mantids (none of which are established) and 6 saltatorial species.

The illustrations are well chosen and the three original coloured plates deserve special mention on account of the truthfulness of the figures in both form and colour.

Mr. Morse's book is a fine model for systematic workers to emulate and should rank as a classic in American entomology. E. M. W.

ERRATA.

For *Gunthrop* read *Gunthorp*, p. 112, line 14.

For *megachile* read *Megachile*, p. 119, lines 5 and 18.

For *argentate* read *argentata*, p. 119, line 11.

For *Tohitic* read *Tahiti*, p. 119, line 16.

For *Tahihan* read *Tahitan*, p. 119, line 17.

For *Trachea fanitima* read *finitima*, p. 121, line 18.

For *Mecistophalidæ* read *Mecistocephalidæ*, p. 184, line 11.

For *Urocerous* read *Urocerus*, p. 216, line 13.

For *flavcornis* read *flavicornis*, p. 216, line 6 from bottom.

CHANGE OF ADDRESS.

The Rev. Professor C. J. S. Bethune has left Guelph and is now residing at Toronto. His present address is as follows:

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With the present volume the Editorship of the Canadian Entomologist passes into new hands. The retiring editor has for some years been conscious of the necessity for this change, owing to the increasing demands on his time of his University duties, which have made it difficult for him to give as much attention to his editorial work as it deserves. It is gratifying, therefore, to know that this work will pass into such capable hands as those of our esteemed colleague, Dr. James McDunnough, of the Dominion Entomological Branch, Ottawa. Dr. McDunnough needs no introduction to the readers of the Canadian Entomologist. His numerous publications on the North American Lepidoptera, among the most important of which are the well-known "Contributions to the Natural History of the Lepidoptera of North America" and the "Check List of the Lepidoptera of Boreal America" have placed him in the front rank of students of this order, and since his appointment to the Dominion Entomological Branch he has extended his activities in several other directions.

In resigning from his office the retiring editor wishes to thank his many friends among our contributors, whose services have been the main source of our journal's continued success, and with whom correspondence has been both a pleasure and a profit.

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE-HISTORY OF A HOBBY HORSE.*

BY FRANCIS J. A. MORRIS,
Peterborough, Ont.

PART II. BOY AND MAN—SAPLING GROWTH.

You may easily guess how little London had of attraction for either Slyboots or Merry Andrew; and instead of seeking after the Babylonish gods therein enshrined, we laboured day by day to recreate the childhood world of our delight. In this, with a fair share of luck and the help of some wise and benevolent elders, we were largely successful.

From the very first our young natures shied like roe deer at the city, snuffing the air and stamping uneasily; and this instinctive distrust we soon nursed into a wholesome hate that grew steadily with the years. London, we both agreed, was nothing but a howling wilderness, and for two reasons only could we ever be induced willingly to enter this arid waste; either to rush out at the other side of it on the northern express, or to visit the great oasis at the heart of the desert—the Zoological Gardens.

Yet another district did indeed form the objective of certain long and dreary pilgrimages, on which we were dragged periodically by the Olympians, to the National Exhibitions, those monstrous displays of human industry and

*Part 1 of this paper was published in the 49th Annual Report of the Entomological Society of Ontario, 1918, (1919) pp. 39-46.

inventiveness; but these left only nightmare recollections of footsoreness and headache, so that the name of Kensington brought a bad taste to the mouth, till one memorable day when we discovered, patiently waiting just round the corner for us there, the great Natural History Museum, and at the door, ready to unlock its treasure-house before two pair of the most excited eyes in all London that day, our old Scotch neighbor, donor of the famous Peacock butterfly.

But for the "Zoo," midsummer day itself was all too short, and this in spite of its having had long leagues of lee-way to make up in the affection of one of us. As a boy of eight or nine I had been taken there once before, and the recollection was anything but pleasant. We all have, even in adult life, our off-days, when we are at loggerheads with the whole world and the universe flies to 6's and 7's. At such times the boy of eight appears "possessed" and goes about not merely tempting fate, but actually goading the imps of vengeance into fury. On the wariest urchin that ever played in Tom Tiddler's ground fall sooner or later humiliation and the heavy hand of outraged propriety. On this occasion our superstitious Scotch nurse, with grave shaking of the head, would have pronounced me "fey" and come nearer the mark, I verily believe, than the matter-of-fact Sassenach who declared I had got out at the wrong side of the bed that morning. Whether I had or not I cannot remember, and all I know for certain is that things went wrong from the very start. Long before breakfast I sallied out into our host's garden and tested the blade of a new knife on the stem of a valuable creeper that was being trained up the side of the house; from here I made my way into the barnyard and tried to teach some young ducks to swim under water, so that when "Joe" the farmhand came to their rescue, two of them were at the last gasp with upturned eyes. Finally, being dared by one of my cousins to vault over the widest part of the duck pond, I essayed the impossible; my pole stuck upright in the middle of the pond and I slid ingloriously down into a watery bed of chickweed and had to be rushed into the carpenter's shop to be dried out, surreptitiously, in time for the train journey. When taxed by my uncle, on reports from the indignant custodians of garden and barnyard, and confronted with a long list of acts of wanton mischief—most of them undeniably a true bill—I burst out laughing in his face; it was then, I suppose, that the avenging Furies took me and the situation in hand.

Retribution came with anything but halting gait. Arrived at the Zoo, I must needs choose a Bactrian beast instead of the camel to have a ride on. Camels were too ordinary, we had seen them at the circus and they had only one hump; besides my brother had chosen the camel, so nothing would do but I must be hoisted up between the two hairy humps of this queer looking squealing quadruped for my ride. But alas! the brute was ill-tempered and bolted from its keeper; before it could be rounded up I got pretty badly shaken and worse frightened. My brother witnessed this whole scene of my discomfiture with huge delight from the back of a docile camel, and his ill-concealed grins on my tearful return were more than I could stand. After fiercely denying that I had been a bit afraid, I managed to break away from the rest of the party to do some sight-seeing for myself instead of providing a spectacle for others.

Where all the jungle and prairie life of the tropics were gathered into a single park, one didn't have to go far for thrilling adventures; indeed, one was fairly jostled on all sides by weird-looking foreigners, such as anteaters, tapirs,

peccaries, yaks and gnus, and I had already had several very exciting *tête à têtes* when I spied a heavily built shaggy sort of antelope—like an African wildebeeste in the centre of a large barred cage, staring intently at me with full, soft, gazelle-like eyes; this gentle, melting gaze drew me to the bars in a kind of fascination, and the llama (so I found it was called) came slowly forward as though to be petted; suddenly, at short range, it spluttered out full in my face a deluge of sour-smelling bread mash—having secretly stowed away this ammunition as cud in the top story of its stomach.

Fortunately, there were no witnesses to this second humiliation and I soon regained my composure. But the rest of the day lives mainly in my memory as a long and dreary succession of disagreeables deepening into horror, in which screeching parrots, chattering apes, and the dumb tragedy of live rabbits fed to coiled staring serpents, figure prominently. On the way home, to cap it all, I had the misfortune to sit down in the railway carriage on my very latest toy, a box of gaily coloured tin ducks and fish that would swim about if you wielded over them the magic wand of a little steel magnet; the glass lid caved in, and two of my aquatic treasures, a green carp and a mandarin drake, met in fatal embrace that reduced them both to a shapeless crumple of painted tin.

However, that day of disasters had long vanished from the scene, and nothing untoward marred the re-appearance of the Zoo in our boyhood's drama. And when we, later, discovered the South Kensington Museum, this formed an even stronger attraction, and many a happy hour did we spend in that fairy land of Natural History. Two other places we unearthed in London where it was just possible for self-respecting humanity to eke out an existence not wholly miserable. In a dingy street of Camberwell where "Mourning Cloaks" (*Vanessa antiopa*) had once flown in the fabulous past, we discovered—sole survival of this age of myth—an ancient dealer in butterflies and moths, setting-boards, cork, pins, and nests of little wooden ointment boxes in which to store our captures. Nearer home still, at Herne Hill, under the sooty arch of a railway viaduct stood a fancier's shop with a most extensive assortment of pets, and often after school we would hurry over to make a purchase.

I don't suppose we had any Quixotic notion of inoculating all London with the serum of rusticity, but we certainly made a most heroic effort to cure our own little suburban corner of all its ailments by a healthy transfusion of country blood; we fairly filled the back yard with white rats, mice, rabbits, Belgian hares, guinea pigs, and pigeons; while in every spare room and corner of the house itself we staked claims for swarms of tiny squatters; caterpillars striped and spotted, smooth, horned and hairy, butterflies and moths, dragonflies, beetles and spiders, were constantly escaping from their glass-lidded confines to disturb the calm of Olympus. We had even in one of the bedrooms an active industry of bird-stuffing and pelt-curing that has long mouldered away in my memory to a confused tangle of wire, cotton-wool, cayenne pepper and scalpels.

The district of West Dulwich in the early eighties still retained no small tang of the country about its atmosphere. There were traces here and there, within a stone's throw of our house in unoccupied fields, muddy pools, and decrepid old willows, of what had once been a sparkling meadow-brook flowing past the old-fashioned residence of Rosendale Hall, which tradition averred

had been the favorite hunting lodge of Queen Elizabeth; and, indeed, astride the back of that letter "n" in the middle of the word "Rosendale," the curious linguist may wing his way back not merely to the days of Good Queen Bess, when doubtless the place was still a valley of roses, but to a time in Old England long before Chaucer when the plural of "rose" was "rosen."

East of us the wooded estates of Edward Alleyn, Shakespeare's friend and fellow actor, were not yet all built over. There were still shady slopes on Gypsy Hill, and though the gypsies with their picturesque tents had vanished forever before a standing army of red and yellow brick houses, the nightingale still sought its ancestral home there among the trees each spring and made music in the land. Beautiful woods still flourished near the Crystal Palace at Sydenham, and an oak grove within the school playground itself, where the voice of the earliest cuckoo might be heard and even its elusive form spied in stealthy flight from tree to tree.

In that same ground, quite close to the Chatham and Dover railway I got my first sight of gaily spotted newts in a neglected clay pond, and once caught in the long grass a beautiful green lizard. It was from here too that I gathered, feeding in a clump of small-headed purple thistles, part of a colony of Black-spined caterpillars to rear at home. The list of British butterflies is a very meagre one compared with that of a great continent like North America, and even of that meagre list quite a number of species were unknown in our part of Scotland. There was frantic joy in the house when these dark thorny caterpillars, after a short pupation emerged into the most beautiful "Painted Ladies" (*Vanessa cardui*). One of the most amazing things to watch was the way they shot out a secretion of pink milk at emergence, squirting it over their wings to saturate them before the work of unfolding and stretching could be safely embarked on.

The whole neighborhood was largely residential; the houses all had gardens enclosed by fences of narrow oak lattice overlapping vertically and topped with a narrow coping of the same; shade-trees—mostly elm, poplar, willow and linden—abounded about the roads; many of the gardens boasted trees and shrubbery, and these wooden fences made a surprisingly good cover for insects at all stages; but, especially, I recall the number and variety of chrysalids to be found in the angle of the coping. We used to tramp the sidewalks for miles, running our eye along this groove by the hour, once in a while glancing down the vertical lines just to take the crick out of our neck and corral any stray game that we might have overlooked on the surface of the fence.

Among other captures made in this way, I recall the Goat Moth, the Leopard Moth, the Lappet and Oak-egger. The Goat Moth (*Cossus ligniperda*) was a large dark-grey creature, whose larva bores in willow and poplar, has a lurid brown-crimson hue, an evil odor, and the enviable reputation of having been eaten by the Romans; we often saw the dark-brown gutterings, like trickles of tobacco juice, at the mouth of their burrows in the poplar trunks. There is in Ontario a closely related genus of the Cossid family in the common *Prionoxystus robiniae*, which I found abundant one summer on Trout Island in the Rideau and occasionally about Port Hope, infesting poplars more often than the locust tree; the Cossus itself occurs in two species of North America, *Cossus centerensis*, a small moth of the Atlantic States, and *Cossus undosus* of the Rockies. The

Leopard Moth (*Zeuzera pyrina*) also belongs to the *Cossidae* and has recently become established on Long Island, as a borer in maple and elm. The Oak-Egger and the Lappet are both of the genus *Gastropacha* and closely akin to the moths of our Apple and Forest Tent caterpillars, all of them being members of the family *Lasiocampidae*.

On our next door neighbor's hedge of lime trees we early took two prizes that filled us with delight, though both subsequently proved to be common; one was the handsome Lime Hawk Moth or Sphinx (*Smerinthus tiliae*) and the other the beautiful Buff Tip Moth (*Phalera bucephala*), whose gregarious larvæ used to crawl down in marshalled hosts to the fences and side walks; this belongs to the family *Notodontidae*, and is next of kin to the famous Puss and Lobster Moths, the extraordinary caterpillars of which were both destined to cross our path at rare intervals, throwing the lucky finder into transports of joy.

Over one of our own garden fences grew a dense mass of ivy, and here, at rest or on the wing we caught many new kinds of day- and dusk- or night-flying moths; the Yellow Underwing, Swallow-tail, Brimstone, Ermine, Currant, and Vapourer are some that I recall; the female of the last was wingless like a penguin, and the caterpillar a very pretty creature, though its tufts of yellow, and the red-and-black floating hairs that we admired proclaim it to have been of the ill-omened tussock brood.

A favourite pastime was net-wielding in the garden at night, and one of the most vivid of these 37-year-old memories is our first encounter with the Ghost Moth (*Hepialus lupulinus*): the male of this creature has a glistening white lustre on the upper surface of its wings and a neutral-tinted yellow-brown on the under; its flight is swift and irregular like a snipe's; in its zig-zag course it presents, now the upper, now the under surfaces of its air-planes in baffling alternation, one moment a dazzling beacon and the next blotted out in some inky pool of darkness; had its position in space been constant like that of a fixed star, or its orbit regular as a planet's we might have tracked it down with the certainty of the rotary lamp on Eddystone Lighthouse, but as it was it would twinkle here and flash again there with all the eccentricity of a runaway comet. Our final capture of this elusive will-o'-the-wisp was a supreme triumph like the landing of a first sea-trout The Rev. J. G. Wood explains in his "Common British Moths," that it is on settling only that the insect disappears, but —*experto crede*—we knew better; while in full flight across an open lawn, at six or eight feet from the ground, it would often disappear and reappear in a single second of time.

(To be continued.)

APPOINTMENT TO ENTOMOLOGICAL BRANCH, OTTAWA.

Dr. F. C. Craighead, late of the Bureau of Entomology, Washington, D.C., arrived at Ottawa at the beginning of the New Year to take up his duties as Entomologist in the Division of Forest Insects. The Branch is very fortunate in securing the services of Dr. Craighead, on account of his wide experience and training.

DRAGONFLIES OF THE LAKE OF BAYS REGION.

BY J. McDUNNOUGH, PH. D.*
Entomological Branch, Dept. of Agriculture, Ottawa.

The period from June 28th, to July 15th, of the summer of 1920 was spent by myself at Norway Point on the Lake of Bays. Considerable collections of insects were made, rather particular attention being paid to the Odonata and allied orders. A list of the species of Odonata taken would appear to be of interest not only as a supplement to Dr. E. M. Walker's reports on the Odonata of Algonquin Park and the Go Home Bay region, but also on account of the fact that several species new to our Canadian lists were observed and the known northern range-limit in such instances considerably extended.

The Lake of Bays region is in general topography very similar to that of Algonquin Park or the Muskoka Lakes. Along the shores of the Lake of Bays proper few dragonflies were observed, but the smaller lakes and ponds proved to be quite rich in species. The main collections were made (1) around Black Lake, a small tranquil lake, just south of the Norway Point golf links, with heavily wooded, precipitate shores, except at a few points at the northern end where the ground was flatter and a considerable growth of sedges and water lilies was to be found; (2) at a small marshy pond on the Baysville road, which I have designated Brown's Brae Pond, and which I unfortunately only discovered during the latter half of my sojourm.

Twenty-six species in all were captured; the following list is probably far from exhaustive, but will at least serve as a basis for further investigations.

ZYGOPTERA.

Coenagrionidæ.

1. *Lestes eurinus* Say.

   Four males of this unmistakable species were taken on July 11th among the sedges at Brown's Brae Pond. As far as can be ascertained from the available literature, this constitutes a new record for our Canadian fauna.

2. *Lestes rectangularis* Say.

   One teneral male was taken on June 24th on a wooded slope rather remote from any body of water.

3. *Lestes disjunctus* Selys.

   A series of more or less teneral males and females was captured on July 11th and 14th around Brown's Brae Pond.

4. *Agria moesta putrida* Hagen.

   Only a single female was taken at Black Lake on July 1st. Two males were captured on July 28th, 1919, on a road skirting the Lake of Bays east of Norway Point.

5. *Enallagma hageni* Walsh.

   Common around Black Lake and Brae Pond, June 23rd to July 8th. A number of the males showed the fifth abdominal segment suffused with black for at least half its length, a feature not noticed in our Ottawa specimens of this species; no difference in genitalia, however,

*Contribution from Ent. Br. Dept. of Agr., Ottawa.

January, 1921

could be detected between these darker forms and the normal one, which also occurred in the same localities.

6. *Enallagma cyathigerum* Charp. (*annexum* Hag.)

One male, June 23rd, Black Lake; taken along with the following species. The genitalia correspond exactly with Williamson's figure of *annexum* in Ent. News, XI, pl IX. Walker records a single male from Go Home Bay (1915, Suppl. 47th Ann. Report, Mar. and Fisheries Branch, 66) so that the occurrence of the species in the present region is not unusual.

7. *Enallagma calverti* Morse.

Both sexes very common in copula around the Brae Pond, July 11th to 14th; a few specimens were also captured at Black Lake in June.

8. *Enallagma aspersum* Hag.

Ten males and one female of this dark-bodied species were taken around the Brae Pond on July 11th. The species does not appear to have been previously recorded from Canada, but the similarity of genitalia of the male specimens to Needham's figure (Bull. 68, New York Sta. Mus., pl. XIX) renders the reference fairly certain.

9. *Nehallenia irene* Hag.

Common during the first half of July in the sedges bordering Brown's Brae Pond, but easily overlooked on account of the low flight and small size.

10. *Chromagrion conditum* Hag.

A single male was taken, June 23rd, at Black Lake. No further specimens were seen, although diligent search was made on subsequent dates.

11. *Ischnura verticalis* Say.

Extremely common all through the season at both places.

ANISOPTERA.

Aeshnidæ.

12. *Gomphus exilis* Selys.

Common along the shores of Black Lake, June 20th to July 1st.

13. *Gomphus spicatus* Hag.

One female taken along with *G. exilis*, June 28th, belongs apparently to this species rather than to *sordidus*, judging by the remarks of Kellicott (Odonata of Ohio) and Williamson (Dragonflies of Indiana) and their descriptions of vulvar laminæ.

14. *Basiæschna janata* Say.

One male, July 1st, and one female, June 20th; others were observed flying over the waters of a shallow inlet of the Lake of Bays.

15. *Aeshna canadensis* Wlk.

Common during July around Brown's Brae Pond and vicinity but difficult to capture. Three males were taken.

Libellulidæ.

16. *Didymops transversa* Say.

Three males and two females were taken June 23rd, July 1st, patrolling along a moist road through a rather dense wood, busily

engaged in capturing mosquitoes. The species was not seen in any other situation.

17. *Tetragoneuria cynosura simulans* Muttk.

One of the commonest species of the district and on the wing during the whole period of my stay. It frequents the borders of woods and open meadows, seldom alighting but tirelessly patrolling to and fro in search of food.

18. *Cordulia shurtleffi* Scud.

Not rare, early in July, on the edges of woods in semi-shady places; it is not a strong flier and is easily recognized on the wing by the brilliant green colour of the eyes. Only males were captured.

19. *Libellula exusta julia* Uhl.

Very common in June and early July on the margin of lakes and ponds, frequently resting on dead logs.

20. *Libellula incesta* Hag.

Three males and two females captured, July 1st and 10th; the species was not uncommon along the shores of Black Lake, the males darting from their resting places for short excursions and returning to sit in their characteristic attitudes on either tree-trunk or twig. Walker (op. cit. p. 92) records the species from Go Home Bay; evidently it has a more widespread northern range than has heretofore been supposed.

21. *Libellula quadrimaculata* Linn.

Quite rare in this region; only two males were captured on the border of woods near Black Lake.

22. *Leucorrhinia frigida* Hag.

Five males were taken, July 11th, among the sedges bordering Brown's Brae Pond.

23. *Leucorrhinia proxima* Cal.

Four males were taken along with *L. frigida*. The species is fond of resting on half-submerged logs and is then not difficult to capture. The pruinose suffusion on the dorsum of the males extends in this species over the fifth abdominal segment whilst in all specimens of *frigida* examined this segment remains black.

24. *Leucorrhinia glacialis* Hag.

One male, taken with the other species of the genus. On the wing it at once strikes the eye by the brilliant red coloration of the base of the abdomen.

25. *Leucorrhinia intacta* Hag.

One female was taken on the roadside, June 20th, near the Brae Pond. Apparently the flight of the species was at this time already almost over.

26. *Sympetrum obtrusum* Hag.

The species was just beginning to emerge, July 11th to 14th, at the Brae Pond. A single pair only was captured but later in the month the species would doubtless become commoner, along with others of the genus.

SYNOPSES OF THE ANTHOMYIID GENERA MYDÆA, OPHYRA, PHYLLOGASTER, TETRAMERINX, AND EULIMONOPHORA (DIPTERA).

BY J. R. MALLOCH,
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The genus *Mydæa* as here limited is essentially northern in its distribution, most of the species being found in the extreme northeast and northwest, with a few occurring as far south as Texas, though rarely. Stein lists about 300 species in this genus, but very few indeed of the species so listed really belong to the genus as I have discovered by examining a great number of the species involved. Most of the species he lists as belonging to this genus from North America belong to *Helina*. The other genera dealt with in this paper have but few representatives in this country, and two of them, *Tetramerinx* and *Phyllogaster*, are unknown from the old world.

Mydæa Robineau-Desvoidy

This genus is distinguished from its allies by having the third wing-vein setulose at base, fourth not curved forward at apex, hind tibia without calcar, penultimate abdominal sternite in female with a number of short bristles, eyes of male subcontiguous, prealar bristle present, prosternum bare, face not buccate.

Key to Species.

MALES.

1. Legs largely or entirely black; knobs of halteres black or brown except in *calvicrura* ..... 2.
   Legs with the exception of the tarsi, and sometimes part of the fore femora, yellowish testaceous; knobs of halteres pale ..... 4.
2. Eyes with dense hairs; halteres pale yellow ..... *calvicrura* Coquillett.
   Eyes bare; halteres black or brown ..... 3.
3. Arista with the longest hairs as long as width of third antennal segment; wings slightly infuscated throughout ..... *obscura* Stein.
   Arista with the longest hairs not longer than its basal diameter; wings slightly brownish, the bases of veins orange yellow ..... *rugia* Walker.
4. Scutellum largely or entirely yellow, contrasting sharply with the colour of disc of thorax ..... 5.
   Scutellum coloured as disc of thorax ..... 7.
5. Palpi yellow, antennæ almost entirely so ..... *flavicornis* Coquillett.
   Palpi black, antennæ almost entirely so 6
6. Hind femur without bristles on posteroventral surface except at extreme apex ..... *occidentalis* Malloch.
   Hind femur with a series of long, fine, rather closely placed bristles on apical half of posteroventral surface ..... *pagana* Fabricius.
7. Antennæ entirely black; longest hairs on arista at least as long as width of third antennal segment; fore femora infuscated except in *discimana* ..... 8.
   Second antennal segment brownish yellow; longest hairs on arista not as long as width of third antennal segment; claws of fore tarsus not as long as apical tarsal segment; fore femora yellow ..... *persimilis* Malloch.

8. All femora largely fuscous; hind tibia with one strong and sometimes one weak anteroventral bristle; prealar bristle minute; wings not yellow at bases.....*obscura* Stein.
   At most the fore and mid femora infuscated; wings yellow at bases, or dorsum of thorax indistinctly vittate.....9.
9. Small species, 5.5 to 6.5 mm. in length; thorax and abdomen with distinct but not very dense pruinescence, the former distinctly vittate only in front; prealar bristle very small.....*winnemanna* Malloch.
   Larger species, 7 to 9 mm. in length; thorax and abdomen with dense yellowish pruinescence, the former with very distinct vittæ.....10.
10. Fore femora yellow; second antennal segment brown; prealar bristle one-third as long as the one behind it.....*discimana* Malloch.
    Fore femora infuscated; second antennal segment black; prealar bristle over half as long as the one behind it.....*urbana* Meigen.

FEMALES.

1. All femora largely or entirely black.....2.
   Femora reddish yellow, sometimes the fore pair brownish or fuscous in part.....6.
2. Eyes distinctly hairy.....*calvicrura* Coquillett.
   Eyes bare.....3.
3. Arista with its longest hairs not longer than its basal diameter..*rugia* Walker.
   Arista with its longest hairs as long as or longer than width of third antennal segment.....4.
4. Third antennal segment distinctly less than 4 times as long as its greatest width; mid and hind femora entirely or almost entirely black or fuscous.....5.
   Third antennal segment at least 4 times as long as its greatest width; mid and hind femora, and especially the latter very indistinctly infuscated.....*winnemanna* Malloch.
5. Calyptræ white; tibiæ yellowish testaceous.....*obscura* Stein.
   Calyptræ orange yellow; legs entirely black.....*obscurella* Malloch.
6. Scutellum largely or entirely yellow, contrasting sharply with the disc of mesonotum.....7.
   Scutellum black, concolorous with disc of mesonotum.....9.
7. Palpi and antennæ yellow.....*flavicornis* Coquillett
   Palpi entirely, antennæ largely black.....8.
8. Humeral angles of thorax broadly yellow.....*occidentalis* Malloch.
   Humeral angles of thorax coloured as disc.....*pagana* Fabricius.
9. Apical segment of fore tarsus disclike, as broad as long; fore tibia with a median posterior bristle.....*discimana* Malloch.
   Apical segment of fore tarsus normal, about twice as long as wide.....10.
10. Arista densely short-haired, the longest hairs barely as long as its basal diameter; fore tibia with 1 posterior and 1 postero-ventral bristle.....*armatipes* n. n. (*armipes* Malloch nec. Stein).
    Arista with long hairs, the longest of which are at least as long as width of third antennal segment, or the fore tibia with or without one bristle.....11.

11. Arista with its longest hairs barely longer than its basal diameter.....*persimilis* Malloch.
Arista with its longest hairs, longer than width of third antennal segment.....*urbana* Meigen.

Ophyra Robineau-Desvoidy

There are but two species of this genus known to me as occurring in America one of which, *leucostoma*, occurs in Europe and in Canada and all over the United States, though less common in the south. The other species is confined to the southern United States in North America, but extends through Central and South America. The larvæ feed in latrines and in manure.

Key to Species.

1. Males.....2.
Females.....3.
2. Hind tibiæ much curved, ventral surfaces with long, soft hairs which are longest just basad of middle; calyptræ fuscous; palpi black.....*leucostoma* Wiedemann.
Hind tibiæ but little curved, ventral surfaces with decumbent setulose hairs; calyptræ yellow; palpi ferruginous.....*aenescens* Wiedemann.
3. Calyptræ subfuscous, the margins darker; palpi black; hind tibia with 3 to 6 anteroventral bristles.....*leucostoma* Wiedemann.
Calyptræ yellow; the margins concolorous; palpi ferruginous; hind tibia with 1 or 2 anteroventral bristles.....*aenescens* Wiedemann.

Tetramerinx Berg.

Key to Species.

1. Legs black, bases of tibiæ and extreme apices of femora reddish; abdomen with a dark dorsocentral vitta; face, parafacials, and cheeks white, almost silvery; wings milky, veins brown; hind tibia with three or four anterodorsal bristles.....*unica* Stein.
Legs black, all of tibiæ and extreme apices of femora reddish yellow; abdomen with black dorsocentral vitta and lateral spots; face, parafacials, and cheeks brownish or bronzy; wings slightly grayish, veins dark brown; hind tibia with two anterodorsal bristles.....*californiensis* Malloch.

Phyllogaster Stein

Key to Species.

1. Males.....2.
Females.....4.
2. Mid femur with some long, strong bristles on basal half of antero- and posteroventral surfaces; hind femur with rather widely placed bristles on entire length of anteroventral surface; abdomen with dorsocentral vitta and lateral spots; mid tibia with an anterodorsal bristle.....*robusta* Johnson.
Mid femur without anteroventral bristles on basal half; hind femur with a few strong bristles on apical half of anteroventral surface; mid tibia without an anterodorsal bristle.....3.

3. Abdomen with dorsocentral vitta and more or less distinct lateral black spots; hind tibia with 1 anteroventral bristle; the pair of long bristles on basal portion of hypopygium widely separated, much closer to lateroposterior margin than to central cleft; processes of fifth sternite as broad as long.....*cordyluroides* Stein.

Abdomen with only a more or less distinct dorsocentral vitta, the lateral spots absent; hind tibia with two anteroventral bristles; the pair of long bristles on basal portion of hypopygium rather closely placed, much closer to central cleft than to lateroposterior margin; processes of fifth sternite longer than broad.....*littoralis* Malloch.

4. Hind femur with rather widely spaced bristles on entire length of anteroventral surface; apical genital segment with two strong thorns; scutellum with numerous setulose hairs on entire upper surface.....*robusta* Johnson.

Hind femur with strong bristles only on apical half of anteroventral surface.....5.

5. Apical genital segment with two strong thorns; hind tibia with one anteroventral bristle; scutellum with a number of setulose hairs on disc.....*cordyluroides* Stein.

Apical genital segment with four strong thorns; hind tibia with two anteroventral bristles; scutellum very rarely with more than two discal setulæ.....*littoralis* Malloch.

Eulimnophora Malloch

This genus is represented by many species in Africa.

Key to Species.

1. Thorax conspicuously vittate; palpi and tibiæ largely yellowish.....*dorsovittata* Malloch.

Thorax inconspicuously vittate; palpi black; tibiæ black, sometimes yellowish at bases.....2.

2. Large species, normally over 4 mm. in length; hind femora in both sexes with from 3 to 6 bristles on apical half of anteroventral surface, the space basad of these with weak decumbent hairs.....*arcuata* Stein.

Smaller species, less than 4 mm. in length; hind femora in both sexes with a series of short erect bristles, which are rather closely placed, from base to apex on anteroventral surface, the apical two or three much longer than the others.....*cilifera* Malloch.

Xenocœnosia Malloch

Key to Species.

1. Males.....2.

Females.....4.

2. Large species, 4.5 mm. in length; abdomen without glossy bare areas on sides of third and fourth tergites; hind femur without dense, soft hairs on ventral surfaces, the antero- and posteroventral surfaces with long, black bristles which are unequal in lengths, the longest one on anteroventral surface about one-third of the femoral length from apex.....*major* Malloch.

Smaller species, 3.5 mm. in length; abdomen with a large, glossy, bare area on each side of third and fourth tergites; hind femur with dense, soft hairs on ventral surfaces, and with or without a fine bristle near apex on anteroventral surface, no other bristles on this surface.....3.

3. Antennæ entirely pale yellowish testaceous; apical scutellar bristle almost or quite as long as the lateral pair; one bristle near apex of anteroventral surface of hind femur very distinctly stronger than the rather short ventral pale hairs.....*calopyga* Loew.

Antennæ with the exception of apex of second segment and base of third black; apical scutellar bristles much weaker than the lateral pair and shorter; apical bristly hair on anteroventral surface of hind femur hardly distinguishable from the very long, pale ventral hairs.....*floridensis* Malloch.

4. Hind femur without a bristle near apex on anteroventral surface, the one nearest apex about one-third from it.....*major* Malloch.

Hind femur with a bristle very near apex on anteroventral surface.....5.

5. Second antennal segment and basal half of third yellowish; apical pair of scutellar bristles little shorter than laterals.....*calopyga* Loew

Antennæ except extreme base of third segment black; apical pair of scutellar bristles very much shorter than lateral pair.....*floridensis* Malloch.

ANNOTATED CHECK LIST OF THE MACROLEPIDOPTERA OF ALBERTA—ADDITIONS, 1919.

BY KENNETH BOWMAN,
Edmonton, Alta.

The following additions to my "Check List of the Macrolepidoptera of Alberta," published by the Alberta Natural History Society (Edmonton, 1919) were made during the season of 1919.

The abbreviations are the same as those employed in the Check List. The numbers before the names are those of Messrs. Barnes and McDunnough's "Check List of the Lepidoptera of Boreal America, 1917." The numbers after the names indicate the months in which the insects have been taken. The capital letters are abbreviations of the localities of capture, as follows: E, Edmonton; R, Red Deer; G, Gleichen; P, Pocahontas; N, Nordegg; B, Banff; Bm, Blairmore.

33	*Pieris occidentalis calyce* Edw	4	E.P.
57	*Eurymus hecla glacialis* McLach	6	N.+
59	" *eriphyle autumnalis* Ckll	5–6	E.B.N.R.
64	" *christina pallida* Ckll	7	N.R.
	" *christina gigantea* Stkr	7	E.N.R.
157	*Argynnis leto* Behr	7	Bm.
185	" *bischoffi* Edw	7-8	P.N.
211	*Euphydryas nubigena beani* Skin	7	P.
283	*Vanessa virginiensis* Dru	7	E.
407	*Heodes helloides florus* Edw	7-8	E.N.R.
794	*Pseudohazis eglanterina* Bdv	6	Bm.
1076	*Melaporphyria immortua* Grt	5	E.

1275	*Euxoa infracta* Morr.	8 Bm.
1315	" *quinquelinea lutulenta* Sm.	9 Bm.
1339	" *campestris* Grt.	8 E.
1986	*Rancora brucei* Sm.	6 N.
2137	*Graptolitha ferrealis* Grt.	4 E.
2380	*Luperina passer conspicua* Morr.	7 E.
2513	*Merolonche ursina* Sm.	6 N.
N.S.	*Autographa diversigna* Ottol.	7 N.+
N.S.	" *interalia* Ottol.	8 E.N.
3333	*Syneda alleni saxea* Hy. Edw.	6 Bm.
3712	*Olene willingi* B. & McD.	7 E.
3972	*Coryphista meadi* Pack.	6 7 Bm.
3999	*Dysstroma cervinifascia* Wlk.	7 N.
4017	*Hydriomena renunciata* Wlk.	5–6 E.
4208	*Eupithecia albicapitata* Pack.	7 E.
4332	*Philobia ulsterata* Pears.	6 E.
4349	*Macaria purcellata* Tayl.	7 N.
4465	*Caripeta divisata* Wlk.	7 E.
4489	*Pygmæna simplex* Dyar.	7 N.
N.S.	*Loxostege albertalis* B. & McD.	7 G.
5032	" *commixtalis* Wlk.	6-7 B.N.
5051	*Diasemia plumbosignalis* Fern.	7 N.
5088	*Phlyctænia ferrugalis* Hbn.	6 E.
5135	*Pyrausta fumoferalis* Hlst.	6 E.

ADDITIONAL RECORDS OF DRAGONFLIES FROM THE OTTAWA REGION.

BY J. MCDUNNOUGH, PH. D.*
Entomological Branch, Dept. of Agriculture, Ottawa.

The following species of Odonata, not recorded in Dr. E. M. Walker's paper (1908, Ottawa Nat. XXII, 16) have been taken by me this past summer in this region.

Zygoptera.

Enallagma calverti Morse.

Common, June 3rd, at Mackay Lake, Rockliffe.

Enallagma carunculatum Morse.

Not uncommon, July 28th on the shore of Leamy Lake, Hull, Que.

Coenagrion resolutum Selys.

Taken along with *E. calverti* on June 3rd.

Anisoptera.

Gomphus descriptus Banks.

One male was captured along Meach Brook, June 13th, about 1½ miles from the railway station of Cascades, Que.

Gomphus spicatus Hag.

Two males, June 3rd, Mackay Lake, Rockliffe.

*Contribution from Ent. Br. Dept. of Agr., Ottawa.

FOUR NEW SPECIES OF MELYRIDÆ (COLEOPTERA).

BY FRANK E. BLAISDELL, SR.,
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It has been recognized for a long time that the species of *Eschatocrepis*, inhabiting principally southern California, possesses pale legs while those from the coastal regions of central California have blackish legs, and as a whole are more deeply pigmented. Casey has mentioned differences observed by him in specimens from San Diego and Santa Barbara. The following species is described at the present time:

Eschatocrepis nigripes, new species.

Form elongate. Colour deep black, more or less shining; antennæ dark rufo-piceous; tibiæ and tarsi rufo- to nigro-piceous. Surface microscopically reticulate. Pubescence short, sparse and more or less grayish. Head not quite as wide as the pronotal apex; front slightly convex, impressions feeble. Second joint of the antennæ subglobular, about as long as wide; fifth joint scarcely triangular, although a little more anteriorly prominent than the contiguous joints. Pronotum slightly wider than long; sides parallel, not strongly arcuate in basal half, broadly sinuate in the apical half behind the apical angles which are moderately small and rather prominent laterally; basal angles obtuse, not rounded nor prominent; base feebly rounded; apex broadly arcuato-truncate and prominent anteriorly in middle four-sixths, laterally oblique and somewhat posteriorly declivous to the angles; disk more or less impressed in the median line, submarginal line strong, surface impressed on the lateral declivity at the sinuations, punctures small and sparse, densely granulato-punctate laterally. Elytra scarcely wider at base than the widest part of the pronotum, about two and two-thirds times longer than the width at base; sides more or less slightly divergent posteriorly, punctuation rather fine, scarcely sparse, surface very feebly rugoso-reticulate; apex slightly serrulate, apical margin somewhat explanate. Abdomen subglabrous, very finely sculptured, punctures denser and finer at apex of the fifth segment.

Male.—More elongate and narrower. Sides of the elytra scarcely divergent posteriorly, apex broadly and very gradually rounded to apex. Fifth ventral abdominal segment transversely truncato-sinuate in middle two-fourths of the apex, lateral fourths oblique and set with a row of stiff marginal hairs; angles rather prominent on their ventral surface and bearing a tuft of slightly longer hairs, intervening apical surface slightly declivous.

Female.—Relatively shorter behind and more dilated. Fifth ventral with a feeble but distinct, rounded emargination, angles raised and distinctly prominent on their ventral surface, forming the sides of the feebly impressed and declivous intervening surface.

Length 2.3–3.2 mm.; width .7–1.3 mm.

Type locality.—Sausalito, Marin County, California.

Holotype, male, and allotype, female, in my own collection. Paratypes in the collection of the California Academy of Sciences.

Habitat.—California (Sausalito and Fairfax, Marin County, April 26th, Leona Heights, Alameda County, May 5th.

It seems necessary to give the above phase a distinctive name, on account of colour, genital characters and other minor differences. It frequents the blossoms of the wild morning glory (*Convolvulus*); it is rather abundant. In *Eschatocrepis constrictus* Lec. the legs are pale and, as a whole, the insect is much less pigmented than *nigripes*.

Casey in his Coleopterological Notices, VI, p. 460, Annals N. Y. Acad. Sci., VIII, July, 1895, created the genus *Eudasytes* for three species which he deemed advisable to separate from *Trichochrous*, the essential difference being the rather wide, flat and horizontal epipleura, and the lateral margins of the elytra narrowly reflexed. The apical angles of the pronotum are usually stronger and more prominent anteriorly than in any species of *Trichochrous*, except a few species like *suturalis*, for instance. I see no reason why *Eudasytes* should not be recognized as a valid genus. At the present time I will describe three new species as follows:

Eudasytes reynoldsi, new species.

Form broad, oblong, about twice as long as wide. Colour black; antennæ piceous, more or less rufo-piceous in basal half; legs rufous to rufo-testaceous; surface rather shining. Pubescence not long, abundant but not hiding the body surface, grayish to subluteo-cinereous in colour and recumbent; pronotal margin fimbriate, fimbriæ erect and of moderate length, not conspicuous; those of the elytral margin similar and obliquely directed; head, pronotum and elytra with stiff, semi-recumbent, sparsely placed and not long nor conspicuous blackish setæ. Head rather small, about two-thirds as wide as the pronotal apex, sparsely to almost densely punctate, punctures moderate in size; surface broadly impressed just between the antennæ, impression more definitely but briefly longitudinally marked laterally. Antennæ stout, joints five to eleven subequal in width, subserrate anteriorly. Pronotum widest at base which is about a third wider than the apex; length a little less than the width of apex; sides almost straight and convergent toward apex, margin subexplanate with the adjacent discal surface almost grooved; apex broadly and deeply emarginate between the anteriorly prominent, rather wide, broadly and evenly rounded apical angles. At the angles the margin is somewhat reflexed and the discal surface distinctly grooved within; base rather broadly arcuate at middle, oblique laterally to become sinuate within the large, prominent and more or less everted angles which are subobtuse at tip; margins of the angles rather reflexed; surface quite deeply impressed within; disk quite strongly convex centrally and anteriorly, slightly impressed within the angles and along the margins, punctures moderate, separated by a distance equal to three or five times their diameter, denser laterally, surface almost separate within the angles. Elytra about a half longer than wide, moderately convex, but somewhat flattened on the disk; humeri prominent, dentiform, everted and obtuse, umbone prominent and rounded; margin somewhat explanate, finely serrulate, arcuately reflexed with the surface rather broadly channelled within, especially at the humeri, broadly rounded at apex, sutural angles rounded; punctuation rather sparse, much coarser toward the base than at apex. Abdomen densely punctate.

Male—More broadly oblong; pronotum broader and larger, basal angles more strongly developed Humeri broadly dentiform.

Female.—Head and pronotum smaller, basal angles of the latter and humeri less strongly developed.

Length 4.0 mm.; width 1.75–2.0 mm.

Type locality,—Truxton Valley, Mohave County, Arizona, June, altitude 4,205 feet; J. A. Kusche collector.

Holotype, male, in my own collection. Allotype, female, and a male paratype, in the collection of L. R. Reynolds, to whom I dedicate the species.

Eudasytes grandicollis, new species.

Form large, stout and oblong, about twice as long as wide. Colour black, pronotum shining; legs rufo-ferruginous; antennæ piceous, rufous toward the base. Pubescence dense on the elytra, sparse and not hiding the surface on the head and pronotum; cinereous, slightly fulvous with a subsericeous lustre, recumbent and moderately long, sparsely intermixed with erect pale setæ, which are more abundant and blackish on the head and pronotum; marginal pronotal fimbriæ pale, moderately long and rather close-set, those of the elytra longer, less fimbriform and not as close. Hairs rather dense on the body beneath. Head moderately large; front not convex, broadly bi-impressed; punctures sparse and rather small, although somewhat coarse on the vertex. Antennæ stout and not extending to the middle of the pronotum, subserrate anteriorly from the fourth joint, where the angles are rounded and somewhat tumid Pronotum large in both sexes, transversely oblong, less than a fourth wider than long; sides parallel, broadly and evenly arcuate, sometimes slightly sinuate or straight just before the basal angles, the latter obtuse and distinct; lateral marginal bead distinctly reflexed; apex broadly and arcuately emarginate, a little narrower than the base and with a distinct reflexed bead; apical angles prominent anteriorly, large, rather broad and narrowly rounded; base broadly and strongly arcuate in middle three-fifths, thence subsinuate to the angles; disk strongly arcuate at the periphery, less so in the broad central area, punctures small and very sparse, surfaces smooth and shining; a distinct submarginal, gutter surrounds the entire disk, rather wide at apex (male) and distinctly widened at the angles, surface somewhat impressed at basal sinuations. Elytra about a third longer than wide; sides parallel, apex rounded laterally but subtruncate at the suture, angle narrowly rounded, marginal bead rather broad and reflexed, especially behind the humeri, the latter with a distinct umbone; disk moderately convex from side to side, punctures small, rather closely placed, surface somewhat rugose. Marginal gutter rather broad, especially near the humeri. Epipleura broad, horizontal almost to the extreme apex, impunctate and without pubescence, except toward the base. Margins convergent on the apical curve. Abdomen finely and rather densely punctate. Legs relatively slender.

Male.—Rather stouter. Pronotum large and heavy. Fifth ventral transversely truncate at apex.

Female.—Head rather smaller. Pronotum smaller. Fifth ventral broadly but strongly rounded at apex.

Length 4.0–4.6 mm.; width 1.7–2.2 mm.

Type locality.—Tonopah, Nevada.

Holotype, male, and allotype, female, in my own collection. Paratypes in the collection of the California Academy of Sciences.

Forty-eight specimens studied. A moderate series was collected at Tonopah Nevada, by my mother-in-law, Mrs. E. C. Peek; a similar series was taken at Goldfield, Nevada, by Mr. F. W. Nunenmacher. The species was collected June 29th, 1907, from the blossoms of an undetermined plant.

A large species related to *amplus* Casey and *oblongus* Casey by the horizontal epipleura, which extends to the extreme apex of the elytra. *Grandicollis* appears sufficiently distinct and inhabits a different region from Casey's species.

Eudasytes hirsutus, new species.

Form oblong, about two and a third times longer than wide, moderately convex. Colour deep black and shining; femora nigro-piceous, tibiæ rufo-piceous, tarsi almost rufous; antennæ rufous or rufo-piceous toward base and piceous distally; mouth-parts more or less rufous. Pubescence brownish-gray and sparse; subrecumbent hairs about a third as long as the long flying hairs which are bristling throughout, sparse and equally distributed over the elytra and pronotum; marginal fimbriæ of the pronotum and elytra long, blackish and not close set. Head moderately large, front scarcely convex, feebly bi-impressed, with a small, smooth feebly convex area near the apical margin; punctures small, irregular and sparse. Antennæ rather stout, subserrate anteriorly, angles blunt and rounded, last three joints noticeably thick. Eyes finely setigerous, setæ short. Pronotum transversely oblong, about a fourth wider than long; sides, subparallel, slightly convergent, almost straight, feebly arcuate, anteriorly broadly and very feebly sinuate posteriorly, margin rather thick; apex broadly emarginate, subtruncate in middle third, not at all beaded; apical angles rather broad, anteriorly prominent and rather more than narrowly rounded; base arcuate in middle third, broadly and feebly sinuate laterally, margined and with a submarginal groove; basal angles rectangular to almost less than a right angle and somewhat prominent laterally; disk broadly and less than moderately convex, most so centrally, slightly impressed at the apical and basal angles, puncture rather coarse, sparse, denser at the angles, smaller in the central area, interstitial surface shining and glabrous. Elytra rather less than twice as long as wide, punctures sparse, not sharply defined, surface more or less rugulose; margin slightly reflexed, rather narrow and with a distinct but narrow gutter; sutural angles rounded. Epipleura horizontal, moderately wide, inflexed at apex at the beginning of the apical curve, inner margin evanescent without convergence to the outer margin; gradually widened from the humeral angles. Abdomen finely punctured, pubescence denser and recumbent.

Male.—Comparatively less broad. Basal pronotal angles more prominent laterally, tips not rounded. Fifth ventral abdominal segment truncate, sometimes slightly impressed at middle of the apex so as to appear feebly sinuate.

Female.—Broader and stouter. Basal angles of the pronotum less prominent and slightly blunt.

Length 2.5–3.5 mm.; width 1.0–1.6 mm.

Type locality.—Tonopah, Nevada.

Holotype, male, and allotype, female, in my own collection; paratypes in the collection of the California Academy of Sciences. Twenty-four specimens

studied. Taken by Mr. F. W. Nunenmacher in July from the blossoms of an undetermined species of plant.

Hirsutus approaches *oblongus* Casey from Utah. It cannot be the same. In the latter the apical angles are acute, pronotum finely punctate, frontal impressions pronounced, legs pale rufo-ferruginous, sides of the pronotum extremely feebly arcuate from base to apex. In *hirsutus* the epipleura are inflexed apically and it therefore agrees with *ursinus* Casey. The specimens of *hirsutus* before me constitute a very homomorphic series and vary only in size.

NOTES ON THE LIFE-HISTORY OF PACHYPSYLLA CELTIDIS-GEMMA RILEY.

BY HARRY B. WEISS,
New Brunswick, N. J.

This species, which was described by Riley in 1884 (Proc. Biol. Soc. Wash. II, p. 74) is locally common in New Jersey, the nymphs forming galls on the twigs of hackberry (*Celtis occidentalis*). These polythalamous galls are deformations of the young buds. They are variable in size and irregular in shape but always bud-like or subglobular and appearing as if formed by a conglomeration of small nodules. Van Duzee (Cat. of Hemiptera, 1917) lists it as occurring in New Jersey, New York, D.C., Va., Ia., Mo., La. and Texas.

The galls are always formed on the new wood and in severe infestations almost every bud is deformed. Each swelling contains from 1 to many cells each of which harbours a nymph. A gall 2 mm. in diameter was found to consist of 1 cell; one of 5 mm. contained 7 cells; one of 8 mm. had 19 cells; one of 9 mm. contained 24 cells and another of 10 mm. had 22 cells. These cells are grouped so that each has a part of the outside wall of the gall covering it. The cells are irregularly oval to subcircular in shape and vary considerably, depending on the sizes of the nymphs occupying them. Galls containing only a few nymphs appeared to have relatively larger cells.

Overwintering takes place in the last nymphal stage, these nymphs emerging through somewhat irregular to regular elliptical openings in the wall of the gall during the last few days of May and the first half of June. These nymphs crawl on the tops of the galls and to the twigs and adults emerge shortly afterward. During the first two weeks of June at Riverton, N. J., where most of the observations were made, adults were plentiful on the stems and leaves of hackberry. Feeding appears to take place chiefly on the petioles of the leaves and on the tender stems, the adults resting head downward. Copulation and egg deposition occur shortly after emergence. Females reared in a cage deposited eggs before taking any other nourishment except that afforded by the dry stems, which was apparently next to nothing. The eggs are deposited on their sides on the lower leaf surface close to a vein or in the angle formed by two veins. Sometimes they are found on the developing shoots or in crevices around the bases of leaf petioles. They are held fast to the leaf or other surface by means of a short backward projecting stipe, arising near the basal end, which is inserted in the tissue. The basal part of the leaf, where the pubescence in the vein angles is thick appears to be a favoured place for eggs. Many eggs are deposited singly and many in groups ranging from 2 to 8 or 10.

It is not known how long it takes for the eggs to hatch. First stage nymphs were not found in the buds until July 20. At this time the buds were not appreciably deformed. From this it appears that over two weeks are necessary. After hatching the nymphs make their way to the small developing buds, crawling between the folded parts and locating in a spot between the centre and the outside of the bud. At first the young nymph is somewhat greenish, but later assumes a yellowish tinge. On September 1, or over a month later an examination of numerous well-defined galls showed nymphs in all stages of growth except the first and the last stages. By the middle and last of September many last stage nymphs were found.

The cells containing the nymphs appeared to be unevenly and thinly lined with a white cottony material. This material increased in bulk as the last stage was approached, and cells containing nymphs of this stage usually had quite a pad of material on that part of the cell directly over the back of the nymph. The hairs on the dorsal part of the body also were covered with the cottony down.

The nymphs collected during the season were easily arrangeable into 5 stages based on their size, but the exact number of instars is not known, due to the difficulty of keeping the same nymph under observation throughout the season. Brief descriptions showing development of the nymphs, are given below. The bodies of the nymphs of all stages are capable of considerable distension, and specimens showing the same dimensions of the head and wing parts vary greatly in the sizes of their bodies, due no doubt to the amount of food in them at a given time.

In addition to the references to this species which are given in Van Duzee's Catalogue, the following one may be noted—Felt., Key to American Insect Galls, N. Y. State Mus. Bull. 200, 1917 (1918), p. 23, fig. 127.

Egg.—Length 0.3 mm. Width 0.1 mm.

Pearly white, smooth, elongate sub-pyriform, rounded at basal end and tapering to acute point at opposite end which bears a fine hair about ⅓ as long as the egg. Widest across basal third. A short, backward projecting stipe arises from near the basal end.

First nymphal stage. Length 0.3 mm. Width of head between eyes 0.1 mm.

Colour lemon yellow; oval, broadest across thorax, abdomen tapering slightly; body flat dorsally or slightly convex, segmentation indistinct. Antennæ whitish, short, projecting; eyes red; median dorsal light line running through head and thoracic segments. Dorsal surface of head evenly and lightly browned, posterior to this area are 2 transverse light brown bands on the thorax and posterior to these bands are many fine transverse brown lines on the abdomen. Lateral edges of abdominal segments bearing minute spines; last abdominal segment terminated dorsally by a comparatively larger spine. Dorsal body surface bearing several fine, short, erect hairs. Outer surfaces of legs lightly browned. Ventral surface lemon yellow. Rostrum extending to second pair of legs, lancets 1½ to 2 times length of body.

Second nymphal stage. Length 0.4 mm. to 0.55 mm. Width of head between eye 0.18 mm.

Yellowish, broadest across thorax. Somewhat similar to first stage except that the dorsal brown markings are faint or absent; anterior margin of head truncate; sides of thorax arcuate; abdomen more elongate, sides rounded and extrem-

ity abruptly tapering to point; dorsal hairs more pronounced; abdominal segmentation more distinct. Legs whitish. Sizes of individuals vary greatly. Some specimens suboval in outline, many elongate, some with greatly distended bodies.

Third nymphal stage. Length 0.7 mm. to 0.8 mm. Width of head between eyes 0.26 mm. Form elongate.

Lemon yellow to orange with faint transverse dorsal markings. Antennæ and legs whitish. Thorax subquadrate; sides of abdomen subparallel or strongly arcuate, with pointed tip. Sides of 2nd and 3rd thoracic segments slightly produced laterally and somewhat posteriorly. Extremity of abdomen brownish. Segmentation more distinct than in preceeding stage. Extremity of abdomen terminating in 2 minute spines or processes directed upward. Dorsal surface of body especially posterior portion of abdomen bearing numerous fine erect hairs.

Fourth nymphal stage. Length 0.91 mm. to 1.34 mm. Width of head between eyes 0.38 mm. Shape somewhat similar to that of preceeding stage. Somewhat chunky. Colour lemon yellow with faint transverse orange markings. Last 3 abdominal segments closely united and brownish. Antennæ whitish with faint brownish bands. Thorax subquadrate, sides of abdomen strongly arcuate. Insect widest across abdomen. Abdomen flat or subglobular. Wing-pads whitish, much more prominent and larger and strongly directed laterally and slightly posteriorly. Legs whitish, articulations dark. Hairs on head, thorax and abdomen more pronounced, those on abdominal segments long and arranged in transverse rows.

Fifth nymphal stage. Length 1.8 mm. to 2.3 mm. Width of head between eyes 0.6 mm. to 0.7 mm. General colour yellowish with faint orange to red transverse markings. Wing pads, legs, last three abdominal segments brownish. Antennæ sparsely hairy, about as long as width of head and banded alternately with white and brown. Eyes prominent, lateral, red. Head transverse with an irregular brown spot on dorsal surface either side of middle. Thorax subquadrate in distended specimens. Wing-pads of meso- and metathorax extending posteriorly to second abdominal segment. Abdomen subglobular, sides strongly arcuate. Body widest across abdomen. Abdomen consisting of 8 segments, last 3 strongly chitinized, dark brown, terminating in a point; abdominal segmentation pronounced, except in last 3 segments which appear to be somewhat fused. Abdominal segments 6, 7 and 8, especially 7 and 8, bearing numerous minute tubercles each bearing a hair. Anal segment consists of a horny process bearing minute teeth or tubercles at its base. Dorsal surface of body, especially posterior part of abdomen, bearing fine white hairs. Legs brownish, light on ventral surfaces. Tibiæ bearing several minute spines and hairs. Ventral surfaces of thorax and abdomen yellowish or yellowish red except for several pairs of median, brownish abdominal spots and the dark markings of last three segments. Rostrum extending to between 1st and 2nd pairs of legs, tip dark.

During the last of May and first part of June the dorsal surface becomes bluish green with orange to red markings. Together with the dark areas, this gives a very attractive appearance to the nymph. The abdomen swells, becomes circular in outline, and the narrowest part of the body is across the 1st abdominal segment. The first 5 abdominal segments become bulged and slight tubercular processes appear on the sides. Many of the specimens measure 3 mm. in length and 1.8 mm. across abdomen at this time.

SOME BRITISH FOSSIL INSECTS.

BY T. D. A. COCKERELL,
Boulder, Colorado.

Carabites scoticus, n. sp. (fig. 28.)

Elytron 5 mm. long, 2 mm. broad, inner basal corner rectangular, margins very slightly convex except at apex and outer base; ten striæ, not counting the inner absolutely marginal one, outermost stria marginal except near base, striæ appearing sharp, but under a high power seen to be weakly and closely punctate; third and fourth striæ (counting from inner margin) uniting at a distance from apex about five times as great as the distance between striæ.

Eocene rocks, Island of Mull, with a series of plants now being described by Professor A. C. Seward. The beetle elytron, which is in the collection at Cambridge University, will be recorded in Professor Seward's paper on the plants, but it seems best to describe it in an entomological journal. There are in the collection two other elytra, too imperfect to describe. One is at least very close to the above; the other is smaller, about 3 mm. long, weakly striate, and is apparently a weevil. *C. scoticus* is in general much like *Anchomenus fuliginosus* Pz., but it lacks the series of strong marginal punctures. It is quite distinct from the Eocene beetles of the south of England.

This is the first tertiary insect from Scotland to receive a name, but J. S. Gardner (Quart. Journ. Geol. Soc., XLIII, pl. XIII) figured a much larger elytron and a hind wing of an Homopterous insect from the I. of Mull beds.

Pseudosiricidæ.

Megapterites mirabilis Ckll. (Ann. Mag. Nat. Hist., March, 1920), from the Eocene of Bournemouth, is the only Tertiary representative of this family. It is a large insect, the anterior wing about 50 mm. long. Its nearest relative, apparently, is *Formicium* of Westwood, from the Lower Purbeck of Durdlestone

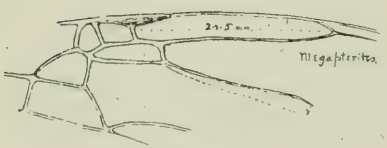

Fig. 26.

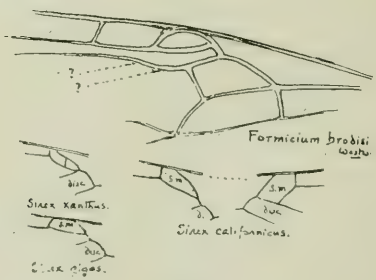

Fig. 27.

Fig. 28.

Bay. The type of *Formicium brodiei* Westw. is in the British Museum, where I have recently examined it. At the same time, the type of *Megapterites* was re-examined in company with Mr. Tillyard, whose keen eyes detected some features in the marginal cell which I had overlooked. After careful examination in a good light, following Mr. Tillyard's suggestions, I must agree with him that the marginal cell is closed and appendiculate at end, and has a cross nervure (in the manner of *Sirex*) not far from the base. It also appears that the original

figure of *Formicium* requires revision, and I give a new one, showing what can actually be seen. The dotted lines followed by ? are probably no more than folds or creases. Presumably there was at least one transversocubital nervure, but it could not be seen.

Comparing these wings with the modern Siricidæ, they are so close that it is not certain that a distinct family is indicated. Probably a subfamily, Pseudosiricinæ, contrasting with the living Siricinæ, would suffice for the fossils. *Formicium* appears to differ strikingly from *Megapterites* in the first submarginal cell, which is entirely separated from the first discoidal, and looks as if it belonged to the marginal series. In *Megapterites* the first submarginal is broadly sessile on the first discoidal, as in most Hymenoptera. The arrangement in *Xeris caudatus* Cress. is not very different from that of *Megapterites*, but *Sirex gigas* L. has the first submarginal separated from the discoidal, much as in *Formicium*. The marginal cell in *Sirex* may be distinctly closed, as in *Megapterites*, or may be open by the fading away of the apical region. A specimen of *Sirex xanthus* Cam. has the first submarginal touching the discoidal on both sides, and on one side the submarginal has a cross-vein, purely an aberration. But the most remarkable specimen is a *Sirex californicus* Norton, the two sides of which are very different, one having the first submarginal broadly sessile on the discoidal, the other having these cells separate. There are other abnormalities in the wings of this insect, but they do not concern our present problem.

THE ENTOMOLOGICAL SOCIETY OF ONTARIO—ANNUAL MEETING.

The Fifty-seventh Annual Meeting of the Entomological Society of Ontario was held at the Ontario Agricultural College, Guelph, on Wednesday and Thursday, November 17th and 18th, 1920, and was well attended, there being present, in addition to members and visitors from various Provinces and others from the staff of the College, several distinguished entomologists from the United States. The following members were present: Dr. E. P. Felt, State Entomologist, Albany, N. Y.; Rev. Prof. C. J. S. Bethune, Prof. L. Caesar, and Messrs. A. W. Baker and G. J. Spencer, O. A. College, Guelph; Messrs. A. Gibson, L. S. McLaine, H. G. Crawford, and E. Hearle, Dominion Entomological Branch, Ottawa; Prof. W. Lochhead, Macdonald College, Que.; Father Leopold, La Trappe, Que.; Mr. F. J. A. Morris, Peterborough, Ont.; Prof. E. M. Walker, Toronto, Ont.; Mr. W. E. Biggar, Hamilton, Ont.; Mr. Jas. Dunlop, Woodstock, Ont.; Mr. E. R. Buckell, Dept. of Agriculture, Victoria, B. C.; and the following officers of the Dominion Entomological Branch: Messrs. C. E. Petch, Hemmingford, Que.; W. A. Ross, Vineland Station, Ont.; H. F. Hudson, Strathroy, Ont., Norman Criddle, Treesbank, Man., and E. H. Strickland, Lethbridge, Alta. Among the visitors present were Prof. C. R. Crosby Cornell University, Ithaca, N. Y.; Messrs. W. R. Walton and L. H. Worthley Bureau of Entomology, Washington, D. C.; Mr. A. V. Mitchener, Manitoba Agricultural College, Winnipeg, Man.; Mr. A. H. McLennan, Dept. of Agriculture, Toronto; Mr. R. H. Gurst, Dominion Pathological Laboratory, St. Catharines, Ont.; and Professors R. Harcourt, J. E. Howitt, D. H. Jones and J. W. Crow, Dr. R. E. Stone, and Messrs. C. R. Klinck, and W. G. Garlick, O. A. College, Guelph, Ont.

On Wednesday a meeting of the Council was held, at which, among other matters discussed, it was decided to hold the next Annual Meeting at Toronto. A committee, consisting of the President, Dr. Walker and Mr. Baker, was appointed to consider the state of the Society's finances. The general session commenced at 1.30 p.m., the President, Mr. Arthur Gibson, occupying the chair. After the presentation of the Reports of the Council and the various officers and branches of the Society, the following papers were read:

Notes on Leaf Bugs (Miridæ) Attacking Apples in Ontario—Prof. L. Caesar.

The Manitoba Grasshopper Campaign, 1920—A. V. Mitchener.

Some Phases of the Present Grasshopper Outbreak in Manitoba—N. Criddle.

The Influence of Locusts on the Ranges of British Columbia (with lantern slides)—E. R. Buckell.

The Beet Webworm Outbreak of 1920—E. H. Strickland.

Paris Green should be discontinued as an Insecticide—Father Leopold.

The Present Status of the Hessian Fy in Western Ontario—H. F. Hudson.

Insects of the Season in Ontario—L. Caesar.

On Wednesday evening a meeting, in the form of a smoker, was held in the men's sitting room of the College Residence, at which Prof. Lochhead acted as chairman. The two principal events of the evening were a masterful address by Dr. Felt, entitled "Some of the Broader Aspects of Insect Control" and the third part of Mr. Morris's delightful "Life-history of a Hobby Horse." Both of these papers were much enjoyed by those present. Dr. Felt's paper was a very able presentation of his subject, while Mr. Morris captivated his audience by the charm of his language and delivery, and the fine scholarship and whimsical humour, which characterized his address. The meeting was enlivened by several musical selections played by the College Orchestra.

On Thursday morning the session was commenced with the election of officers for the ensuing year, with the following results:—

President—Mr. Arthur Gibson, Dominion Entomologist.

Vice-President—Mr. F. J. A. Morris, Peterborough.

Secretary-Treasurer—Mr. A. W. Baker, O. A. College, Guelph.

Curator and Librarian—Mr. G. J. Spencer, O. A. College, Guelph.

Editor—Prof. E. M. Walker, Toronto.

The following papers were then read:—

Further Evidence of the Effectiveness of Mercury Bichloride in the Control of the Cabbage Root Maggot in British Columbia.—R. C. Treherne and M. H. Ruhman.

Some Further Data on the Cabbage Maggot—L. Caesar.

Interrelations in Nature—W. Lochhead.

The Control of the Rose Midge—W. A. Ross.

Discussion of the European Corn Borer. This symposium was one of the chief features of this year's meeting. It was opened by Messrs. Arthur Gibson and L. S. McLaine on the outbreak of this pest in Ontario, and was followed by Messrs. L. Caesar, H. G. Crawford, W. R. Walton, L. H. Worthley and E. P. Felt.

Some Mosquito Problems in British Columbia—E. Hearle.

Wohlfahrtia vigil, A New Sarcophagid Parasite of Man—E. M. Walker.

Mailed January 31st, 1921.

PROF. E. M. WALKER, M. D.

The Canadian Entomologist

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RETIREMENT OF DR. E. M. WALKER AS EDITOR.

Owing largely to increased duties, Dr. Walker has found it necessary to tender his resignation as Editor of the Canadian Entomologist. When his esteemed predecessor, the Rev. C. J. S. Bethune, found it necessary to relinquish the editorial duties, the Council of the Entomological Society of Ontario was fortunate in persuading Dr. Walker to take up this work. Dr. Walker has served the Society and entomologists generally for a period of eleven years in a most faithful and painstaking manner, and as President of the Society I feel that I am voicing the opinion of all our members and subscribers in recording here our warm appreciation of his valued services during such a long period. Dr. Walker has enriched to a marked degree the literature relating to Canadian insects, and in view of his personality and his attainments he is held in high regard, not only by entomologists resident in Canada, but by those of other countries as well.

The duties of an editor are not always along paths strewn with roses, and for this and other reasons one sometimes wonders why any person is persuaded to edit a scientific journal. The true reason, of course, is a love for the work for its own value and the effort to assist in the general advancement of the science. Dr. Walker has certainly conducted his duties in a most pleasing and acceptable manner. We wish him further success in the important work he is doing at the University of Toronto.

As mentioned in the January number, Dr. J. H. McDunnough, Chief of the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa, Ont., has been appointed Editor in place of Dr. Walker. Dr. McDunnough has a wide reputation as an entomologist, and the Society is fortunate in securing his services.

ARTHUR GIBSON.

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE-HISTORY OF A HOBBY HORSE.

BY FRANCIS J. A. MORRIS,
Peterborough, Ont.

PART. II.—BOY AND MAN—SAPLING GROWTH.

(Continued from page 5, Vol. LIII.)

Slyboots and I had already suffered a partial separation; he attended a school at Gypsey Hill, while I was entered at Dulwich College. Among his teachers was Theodore Wood who gave lessons in Entomology, and it was at this time that we acquired his kinsman's books on British Moths and on Beetles, and thus laid the foundations of a little library including Coleman's Butterflies, Atkinson's Birds' Eggs and Nests, and a work illustrating Spiders, Dragonflies, Wasps and other Insects, which has long vanished, even to its author's name.

Among my brother's schoolmates was one whose life ambition was to be a doctor, and already at 15 he took his profession and things in general very seriously. In the newcomer's friendship I had of course some share—a jackal's if not a lion's—and was allowed to attend the séances held in a room over his father's coach-house. These séances were mostly of a chemical character, accompanied by mephitic odours and ending in loud, glass-flying explosions. Various creatures, birds and mammals, were boiled down and their bony anatomy taken apart and then carefully reconstructed. His greatest treasure was a human skeleton, begged, borrowed, and bought piecemeal and with great trouble; it was far from perfect and some of the parts had been contributed (without their consent) by lower animals; it was not even entirely of one sex, and its age varied from a small boy's to an old woman's. This monstrous apparition occupied a kind of dias at one end of the attic and never failed to lend an atmosphere of awe to this young Sawbones' feasts of reason.

It was under his guidance that we made our way to quite distant points in the country side, Streatham Common, Epsom, stretches of the river Mole by Box Hill and Leatherhead, and Carshalton with its beautiful reaches of the river Wandle, subject of one of Ruskin's most eloquent laments. His favorite out-door hobby was fossil-hunting, and it was by that avenue that we were led to our first view of the chalk downs near Caterham Junction. We took train to Croydon and then tramcar a mile or two beyond. Here lay some chalk pits in the side of a broad expanse of rolling heath. Many a long hour in the dazzling glare of the chalk did we spend, digging out sea-urchins, trilobites, ammonites, anemones, sponges, corals, and shark's teeth from the walls of the pit, or raking over refuse heaps. And, of course, it was not long before we discovered how interesting were the downs that had covered this prehistoric chalk bed with new and varied life. There were numbers of stone-chats, and plovers, and larks about the thickets of gorse; once a hare being coursed, with backward-staring eyes, sprang full against my legs as it mounted the hillside. On the downs we captured several "hair-streaks" and "chalk-blues" that were entirely new to our collection, and on the homeward trip one day we had an encounter that capped them all for thrills.

We had made our way down from the breezy heath into a hollow road with high, uncut hedges on either side, and presently the road widened out into two, an upper gravel road and a low wagon track, with a gentle slope of short grass between. Up and down about this turfy space went flights of the most beautiful creatures we had ever seen; they flew low and somewhat heavily, an easy mark for the net. The forewings were deep indigo-green with large spots of rich crimson, the hindwings entirely crimson, both pairs long and narrow, gently rounded at the apex. It proved to be the 6-spot Burnet Moth, one of the *Zygænidæ*, a family not very well represented on our continent of North America.

The astonishing beauty of these Burnet Moths in the sunlit lane has helped to impress the whole scene of this first encounter indelibly on the mind. Even now as I bend my thought steadily on this remote point of the past, every detail of the road stands out again like some invisible ink under the action of sunlight.

The wild luxuriance of the uncut hedges, festooned with bryony and traveller's-joy, and gay with roses, the widening roadway with a grassy space in the middle, the flash of discovery, the eager chase, the triumph of capture, all comes back to me, even to the figure of the boy kneeling over his net in the turf, and presently, as the scene is thus unrolled before me, like something laid away in lavender and fresh from memory's store-room, from its inner folds a most wonderful fragrance comes wafted to me over 36 years till the whole air is redolent with it, and I know that wild thyme must have been blowing all about that grassy bank where these fairy birds of Paradise were flying.

A rarer treat than all these trips of our own planning was a visit to our cousins in Chislehurst. This always meant a day teeming with excitement and netting us many a rare addition to our cabinet. The very moment we entered my uncle's big kitchen garden on our initial visit, we spied the first real live Peacock butterfly we had ever seen, sailing down towards a patch of "live-for-ever"; this bed of orpine proved a regular paradise of a hunting ground, where we captured Brimstone butterflies, Red Admirals, Tortoiseshells, and Peacocks in dazzling succession. Upon the enclosing walls of the kitchen garden were trained the spreading branches of various fruit trees, pear, cherry, peach, apricot and nectarine; and all about among the clustered blossoms and fruit hung bottles and other contrivances for catching insects; these were all carefully examined and several new specimens of beetle or wasp or moth or butterfly fished out; most of these traps were filled with liquid, and the lepidopters were spoiled, but here and there hung a kind of glass cage in which live prisoners could be seen still fluttering.

After exhausting for the nonce all the treasures of this Eldorado we passed out of a postern gate in the wall to a gymnasium on the edge of a small wood. Here while rummaging about I discovered a great rarity—the only genuine English hornet I have ever clapped eyes on; it was lying in a clutter of cobwebs at the corner of one of the tall windows, stark dead, but a perfect specimen for the cabinet.

This first visit to Foxbury was, I really believe, unparalleled for the range and splendour of its captures. And before we returned home each of us had another windfall of luck to his share; Slyboots went hunting along a privet hedge not far from the kitchen garden, and presently excited shouts of some wonderful prize brought me tearing across one of my uncle's pet flower beds from the heart of the shrubbery. An enormous caterpillar, striped and horned, of vivid green, was the cause of the outcry, and after gloating over it in envious admiration, I set to work feverishly searching an adjoining hedge. And fortune certainly proved lavish to both of us that day, for each took two more specimens busy feeding on the privet; they were all much of a size, though hardly of the same brood, unless the mother moth had laid its batch of eggs at widely different points.

In about four days they stopped feeding and pupated, but I cannot recall more than one emerging from the chrysalis as a mature Privet Hawk moth. Almost more wonderful than the plumage and spread of pinion of these miniature hawks was to watch the great larvæ feed and crawl. The skin was translucent

and you could see the movements of breathing and circulation quite plainly under the surface. During the active feeding the creature, I recall, when handled, gave a decidedly pleasant sense of contact, being plump, firm, and of remarkable coolness; when full fed, the skin hardened and became opaque.

It was on this visit, too, that we found the nests of the Lesser Whitethroat and the Spotted Flycatcher, the latter cunningly hidden under the thatched eaves of a cow-byre; over our heads in the oak wood we spied the beautiful long-tailed tit, and at our feet among the hazels great patches of wild hyacinth—the English "bluebell," so different from the Scotch flower of that name—the harebell. And on the way home in the growing dusk, as we passed down a lane between hawthorns and a chestnut grove, I was attracted by a rustling in the bushes, and presently the giant body of a beetle issued from the top of the hedge and launched itself into airy flight; the capture of this magnificent creature, an antlered male of the European stag-beetle *Lucanus cervus*) was for me the top-rung in the whole ladder of climbing wonders this day had lifted up before us.

We did not often make a visit to Chislehurst, but whenever we went we added some treasure of discovery. One showery afternoon I remember, I found clinging to the long grass blades in a hay-meadow my first specimens of the Orange-tip butterfly, and the Marbled White, an insect unknown in Scotland; again, on a brilliant day of July, just after lunch, I spied among the oaks a Purple Emperor, and after more than an hour's anxious watching was able to seize a lucky instant of its powerful flight and sweep it into the net from near the base of its imperial throne. These oak woods were a favorite haunt of the Night-jar or Goat-sucker, and on warm summer nights I often lay awake listening to the prolonged churring music of the bird; a sound that haunts the memory as lingeringly as the note of the Perthshire corncrake or the weird challenge of our Whip-poor-Will, its next of kin on this continent. Like the Night Hawk and the Whip-poor-Will, the bird rests lengthwise on the limb of a tree, and so perched, spins out its long-drawn purring monotone; the slightly ventriloquial character of the sound, they say, is due to the bird turning its head this way and that while singing. The structural affinity of these three birds and their kinship with the Swifts lent a double interest to my first meeting with the two American cousins of our British Night-Jar.

Before we had been three years in England, Slyboots set sail for Australia, and Merry Andrew was thrown once more on his own resources. School studies had already begun to claim most of my spare time, and the collection made little progress; once I captured a magnificent Muskbeetle, the only Longicorn with which I was familiar as a boy; once a visit to the South coast brought me into contact with the Clouded Yellow butterfly, whose powerful flight and wariness taxed all one's skill with the net; and a stay near Oxford secured me three or four new species of dragon-fly. But the boyish interest in collecting waned fast, and when our whole cabinet was stolen from a warehouse at Malvern during my freshman year at Oxford, regret at the loss of all these treasures so laboriously gathered and so lovingly guarded was deplorably quick in the passing.

(To be continued.)

THE NERVOUS SYSTEM OF THE LARVA OF *STHENOPIS THULE* STRECKER.

BY J. M. SWAINE,
Entomological Branch, Ottawa.

(Continued from p. 283, Vol. LII.)

COMPARATIVE STUDIES OF THE LARVAL NERVOUS SYSTEM IN LEPIDOPTERA.

A Summary.

A comparison of the nervous system of the larvæ of the Jugatæ with that of other caterpillars of the Lepidoptera and Trichoptera reveals several interesting conditions, two of which appear to have special significance.

It is not proposed to generalize too freely from the results of these few dissections, but rather to suggest that the well defined differences in the larval nervous system may be worth more exhaustive treatment in connection with the study of the phylogeny of the group. It may be that the larval nervous system in the Lepidoptera and Trichoptera has been less modified throughout the evolution of the groups than has any other organ of either larva or adult, and since the characters exhibited are so distinct that in some cases genera and even species may be determined from them, the evidence they present must be of value. Dissections of determined larvæ throughout the Trichoptera and in the lepidopterous families Nepticulidæ and Prodoxidæ, examples of which were not available to me at the time, should prove of special interest.

The Lepidoptera were divided by Professor Comstock into two sub-orders, the Frenatæ and the Jugatæ, the latter comprising the two families Hepialidæ and Micropterygidæ. Judged by the characters of the adult the members of the Jugatæ were considered to be the most primitive of the Lepidoptera; and the study of the pupal wing-venation of *Sthenopis thule* by Dr. MacGillivray supports this view. The most recent catalogues of the North American Lepidoptera do not recognize this subdivision into Frenatæ and Jugatæ but place the families Hepialidæ and Micropterygidæ as the lowest of the order. Still more recently the Micropterygidæ have been included with the Trichoptera.

It is, therefore, of considerable interest to find that the larval nervous system of *Sthenopis* and of one species of the Micropterygidæ are closely similar in the two most prominent characters and are far more widely separated from all the Frenatæ, as represented in our dissections, than are any two families of these so-called higher Lepidoptera from each other; that in one respect at least they are much more highly modified; and, further, that the larval nervous system of the Trichoptera agrees most closely in these characters with the higher families of the Frenatæ.

The larval stages of the primitive stock from which both Lepidoptera and Trichoptera have descended must surely have had a nervous system of a primitive type, and from this the nervous systems of our modern caterpillars and caddice-fly larvæ must have been derived.

Since the nervous system of primitive insects apparently included a double chain of ganglia, longitudinal connectives and transverse commissures throughout the length of the thorax and abdomen, with at least one pair of ganglia in each abdominal segment, evidence of advanced modification should be indicated

by cephalization of the abdominal ganglia and by adhesion and fusion of the longitudinal connectives. We should, therefore, expect to find the Jugatæ exhibiting a tendency towards retaining a larger number of abdominal ganglia and showing a lesser degree of fusion of the connectives, with the opposite tendencies becoming more strongly marked in the higher families of the Frenatæ. In the Rhopalocera at least we should expect to find a decided advance over the condition found in the Jugatæ. The actual condition is that the Jugatæ have one more abdominal ganglion, and are in that respect more primitive; but, on the other hand, they are infinitely more highly modified in that both the thoracic and abdominal connectives are completely fused for their entire length.

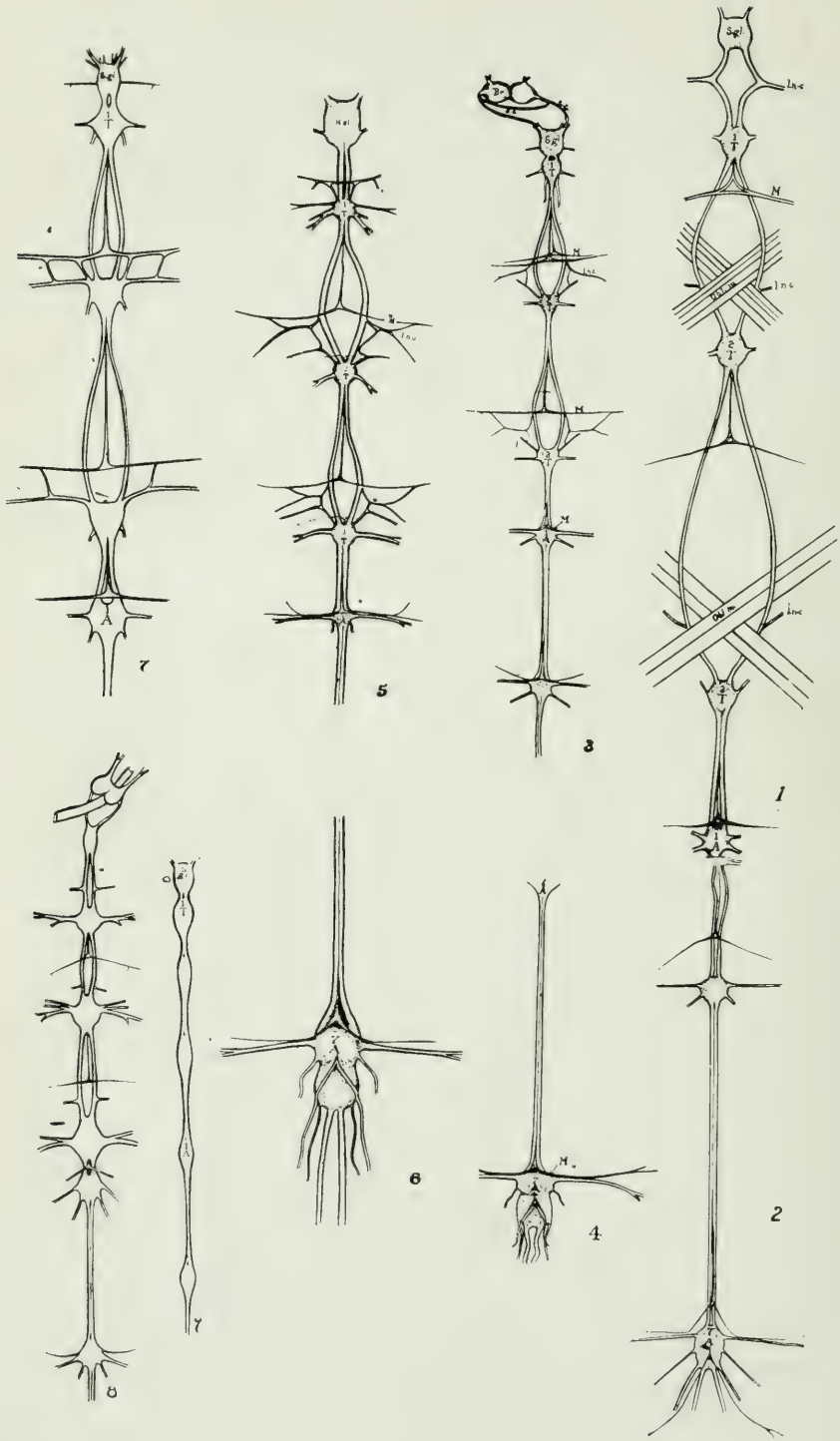
It is usually assumed that the Lepidoptera and Trichoptera are closely related in origin, and that the latter approximate more nearly to the original ancestral type from which both orders have apparently arisen. We should, therefore, expect the larval nervous system of the caddice flies to be more nearly like that of the lowest families of the Lepidoptera. It is interesting to find that the exact opposite is the case; the Caddice flies, as represented by the species dissected, approximate most closely in this regard to the Rhopalocera, and the Hepialidæ and Micropterygidæ stand out together remarkably distinct from both the Frenatæ and the Trichoptera.

In all the Frenatæ the connectives in the last two thoracic segments are widely separated, with the oblique muscles passing out between them. This, supposedly a primitive character, is especially prominent in the Rhopalocera, but occurs throughout the subfamily. Even in the abdomen the double origin of the connectives is indicated by an impressed median line, apparently throughout the Rhopalocera, in the Sphingidæ, and variably in other families of the Frenatæ. In the Jugatæ, however, as represented by the two species of *Sthenopis* and the eriocranid I have studied, these connectives are absolutely fused throughout the thorax as well as in the abdomen. When it is considered that this modification also involves a great alteration in the relations between the connectives and the oblique muscles of the thorax, it would appear that these larvæ of the Jugatæ are in this important character very much more highly modified than any of the Frenatæ.

On the other hand, the larvæ of all the Frenatæ appear to be more highly modified than those of the Jugatæ in that they have only seven abdominal ganglia in the ventral chain, although the last, the seventh, is always evidently composite, and in some groups partly divided into two ganglia. In *Sthenopis*, and also in the eriocranid dissected, there are eight abdominal ganglia, the last evidently composite.

The Trichopterous larvæ dissected have only seven abdominal ganglia and have the connectives in the thorax widely separated throughout their length, much as in the Rhopalocera.

The highly modified condition of the thoracic connectives indicates that the Jugatæ were separated from the main stock, from which the Lepidoptera and Trichoptera were derived, at a very early period, even before the separation of the Trichoptera and, following a different line of development, have retained markedly primitive characters in the wing-venation of the adult and the eight distinct abdominal ganglia in the ventral chain of the larva, although



NERVOUS SYSTEM OF LEPIDOPTERA.

(See page 34.)

passing far beyond all others of their kin in the degree of fusion of the connectives in the larval nervous chain.

Further Details of a Few Dissections.

The nervous system was examined in a series of caterpillars representing all the families available at the time. A brief outline of a few examinations will be sufficient for the present purpose.

Papilio polyxenes Fabr.

Plate II, Figs. 1 and 2.

The condition shown in the figures appeared to be general in the butterflies. The thoracic connectives are widely separated throughout with the oblique muscles passing between them in the 2nd and 3rd thoracic segments, with a lateral nerve from the connectives of all three thoracic segments. The abdominal connectives are separated for a considerable distance in front of each ganglion and their double origin is indicated on the remaining part by a strongly impressed median line. There are seven abdominal ganglia, with the last longer than wide, but not constricted, indicating its double origin only by the number of nerves to which it gives rise.

Ceratomia amyntor Hbn.

Plate II, Figs. 5 and 6.

The infraœsophageal ganglion is thick and shows traces of an impressed median line. The connectives between that and the 1st thoracic ganglion are longer than in *Sthenopis thule* and distinctly separated, though adjacent. Between the 1st and 2nd thoracic ganglia the connectives are widely separated, except for a short distance behind the first ganglion, where they are adjacent. They are distinctly separated at their insertion into the 2nd ganglion. The connectives between the 2nd and 3rd thoracic ganglia are as those between the 1st and 2nd. Those between the succeeding ganglia are adjacent, but distinctly separated. This is a condition far removed from that in *S. thule* with an almost solid ventral cord.

Distinct nerves from the connectives are found between the 1st and 2nd and the 2nd and 3rd thoracic ganglia, but not elsewhere. They are connected with the transverse branches of the median nerves and with the first pair of nerves from the ganglia. The development of the median system is indicated sufficiently for the present purpose in the figure; as usual, it is most highly developed in the thorax. The last ganglion, the 7th abdominal, is elongate and evidently constricted.

Sphinx kalmiæ S. and A.

The ventral cord is similar to that figured for *Ceratomia*, except that the connectives are adjacent in the thoracic segments for almost the cephalic half of their length, and the abdominal connectives are much more completely fused, though still showing a median line. The median and connective nerves of the 3rd thoracic segment are complex, as in *Ceratomia*. The last ganglion is evidently complex, with a distinct constriction.

Sphinx drupiferarum S. and A.

The connectives are more slender in the abdomen than in *Ceratomia*, but still showing everywhere the median line which indicates their double origin. Those of the 1st abdominal segment are about three times the length of the

1st abdominal ganglion, and with the median line very heavily impressed. Those of the 7th abdominal segment are distinctly separated on both the cephalic and caudal thirds of their length. The last ganglionic mass, in the 7th segment, is in the form of two distinct ganglia, the last, or 8th, being separated from the 7th by extremely short but evident connectives.

Tropæa luna L.

Plate II, Figs. 3 and 4.

The connectives of the 1st thoracic segment are extremely short; the abdominal connectives are impressed along the middle line, and the thoracic connectives are fused for a short distance behind the 1st and 2nd thoracic ganglia.

Eacles imperialis Drury.

The connectives are widely separated between the subœsophageal and the first thoracic ganglia, widely separated on the caudal half only and adjacent in front in the 2nd and 3rd thoracic segments. In the abdomen the connectives are slender and completely fused except for a narrow but complete separation for a short distance in front of the ganglia. The median line can rarely be traced throughout the length in the abdominal connectives. This condition is in sharp contrast to that found in the Sphingidæ. The last ganglion is very elongate but only feebly constricted at the middle. The median nerve in the 2nd and 3rd thoracic segments is extremely complex.

Schizura concinna S. and A.

In *Schizura* the connectives between the subœsophageal and the 1st thoracic ganglion are short, hardly longer than the 1st thoracic, but separate and apparently without nerves; these latter appear to arise from the 1st ganglion. The connectives between the 1st and 2nd thoracic ganglia are united for the cephalic half and widely separated on the caudal half, with the usual nerve from each side and the oblique muscles emerging between the connectives. The median nerve of this segment is well developed and branches about one-third the distance in front of the 2nd thoracic. The connectives between the 2nd and 3rd thoracic ganglia are widely separated for the entire length, and the median nerves separate about one-third the distance behind the 2nd ganglion. The connectives of the abdominal segments are united, although the median line of union is visible and the two are distinct immediately cephalad of each ganglion. The last two ganglia are closely connected, without visible connectives, but recognizable as two ganglia.

Datana ministra Drury.

The connectives between the subœsophageal and the first thoracic ganglion are distinctly separated and slightly longer than the first ganglion. The next pair of connectives are separated, except for the cephalic eighth or less, and distinctly separated behind at their insertion; the connective nerves arise very close to the ganglion, less than one-half its diameter from it, and the median nerve branches about midway between the ganglia. The connectives in the 3rd thoracic segment are similar, but with the lateral nerves still closer to the ganglia and the median nerve considerably shorter. The connectives of the 1st abdominal segment are shorter, and divided for the caudal half of their length. The remaining abdominal connectives are fused completely, except for the median split in the caudal fifth. The last pair are shorter and divided for

nearly the caudal half. The last, 7th, ganglion is longer than wide, with a slight median transverse constriction, and evidently composite.

Callopistria floridensis Gn.

The connectives between the subœsophageal and the 1st thoracic are short and widely separated. Those between the thoracic ganglia are widely separated for the entire length. The median nerve branches about one-third the distance behind the ganglion. *The lateral nerves of the connectives are pushed backwards so that they arise from the base of the connective as it leaves the ganglion, and therefore appear almost to arise from the front angle of the ganglion itself.* The connectives between the third thoracic and the first abdominal are short and separated on the caudal third. The remaining abdominal connectives are slender, elongate, entirely fused on the cephalic four-fifths, and distinctly separated on the caudal fifth. The median nerves in the abdomen are very slender, degenerate, separating shortly before the ganglion, passing caudad and laterad for a short distance with the first ganglionic nerve of its side. The last two ganglia are united to form an elongate mass, and this is separated from the preceding ganglion by separated connectives not quite so long as the caudal ganglionic mass.

Euxoa ochrogaster Gn.

The connectives between the subœsophageal and the 1st thoracic ganglia are short but separated. The connectives between the thoracic ganglia are entirely separated, and divided by the oblique muscles. The lateral nerves from the connectives are close to the ganglia, those from the first pair arising at the base of the connectives as they leave the second thoracic ganglion, and those from the second pair arising a very short distance in front of the third thoracic ganglion. The median system is highly developed in the thorax. The connectives between the third thoracic and the first abdominal ganglion are less than twice as long as the ganglia and separated for almost the entire length. The remaining abdominal connectives, except the last pair, are fused except for a short distance, about one-sixth the length, immediately cephalad of the ganglia. The last pair of connectives are hardly longer than the last ganglionic mass and are separated for more than the caudal half of their length. The last ganglion is longer than wide and evidently represents the 7th, 8th (and 9th) very completely fused. A delicate pair of nerves arise from the caudal part of the dorsal face, representing the median nerves of the last segment.

Geometridæ.

A geometrid was dissected, an alcoholic specimen of uncertain species. The connectives in the abdomen are more closely united than in most others, and approach the condition found in *S. thule.*

The connectives between the subœsophageal ganglion and the 1st thoracic are short, hardly longer than the 1st ganglion but quite distinctly separated. The connectives between the three thoracic ganglia are separated for almost the entire length, lying side by side for less than a fifth the length behind each ganglion. The median nerves are well developed as are the lateral nerves of the connectives, which arise a short distance in front of the ganglia. The abdominal connectives are thoroughly fused on the cephalic four-fifths of their length, forming a simple cord, but are distinctly though slightly separated for

nearly a fifth of their length before each ganglion, with the well-developed median nerves arising between them well in front of the ganglion. The last two abdominal ganglia are adjoined with an indication of very short connectives.

Prionoxystus robiniæ Peck.

Plate II, Fig. 7.

The connectives in the thorax are adjacent for a short distance, and those in the abdomen are split for one-fourth their length in front of each ganglion. There are seven abdominal ganglia, the seventh solid but composite. The median system is very coarsely developed in the thorax.

Micropterygidæ.

Plate II, Fig. 9.

I have been able to obtain caterpillars of one species of this family through the kindness of Mrs. J. D. Tothill. The larva is a miner of *Spiræa discolor* on Vancouver Island. The material was collected by Mrs. Tothill and determined by her as probably belonging to the genus *Mnemonica*. The caterpillars had been a long time in alcohol, and the lateral nerves could not be isolated satisfactorily. The ganglia and connectives were distinct, however, and are represented roughly in figure 9. The thoracic ganglia are very large and the thoracic connectives are thick, rather short and completely fused throughout their length, except for a median impression in front of each ganglion. There were eight abdominal ganglia. So far as this evidence goes, therefore, the Micropterygidæ stand with the Hepialidæ, forming a group very widely separated from both the Frenatæ and the Trichoptera

Trichoptera.

Plate II, Fig. 8.

Only one species of this Order was available at the time; it was an undetermined species belonging to the Phryganeidæ.

The ventral chain agrees closely in its most striking characters with those of the Rhopalocera. The connectives of the thorax are definitely separated throughout their length, giving rise to distinct lateral nerves, and there are only seven abdominal ganglia. Further dissections throughout this order may show very interesting conditions.

PLATE II.

Figs. 1 and 2.—*Papilio polyxenes* Fabr. Part of the ventral chain.

Figs. 3 and 4.—*Tropæa luna* L. Ventral chain of the larva, brain and subœsophageal ganglion to the second abdominal ganglion and the last.

Figs. 5 and 6.—*Ceratomia amyntor* Hbn. Ventral chain of the larva, subœsophageal ganglion to the first abdominal ganglion and the last.

Fig. 7.—*Prionoxystus robiniæ* Peck. Ventral chain of the larva, subœsophageal ganglion to the first abdominal ganglion, showing origins and lateral nerves of the thoracic segments.

Fig. 8.—*Trichoptera.*—Ventral chain of an undetermined larva belonging to this order. Brain and ventral chain caudad to the second abdominal ganglion, showing origins of median and lateral nerves.

Fig. 9.—*Micropterygidæ.* Ventral chain of a larva of the genus *Mnemonica* showing only the ganglia and connectives of the ventral chain from the subœsophageal to the second abdominal ganglion.

A NEW CLASSIFICATION OF THE ORDER PERLARIA.

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For some years past I have been studying the Perlaria of Australia and New Zealand, about which little has been made known up to the present. Taken in connection with the forms already described from Southern Chile, Patagonia, Tierra del Fuego and the Subantartic Islands, these insects form a very distinct Notogæan Fauna, clearly marked off from the Perlaria of the Northern Hemisphere and of the Tropics by the fact that it is made up almost entirely of very archaic types. No representatives of the highly specialized Perlidæ (including Perlodidæ) occur in these regions; no Pteronarcidæ, in the strict sense in which that family will be defined in this paper; no Capniidæ, Taeniopterygidæ or Leuctridæ; and only one or two isolated forms of Nemouridæ (genus *Udamocercia* of Enderlein).

In attempting to classify the known Notogæan forms of Perlaria, I have had recourse not only to all available imaginal characters, but also to as careful a study of the individual life-histories as the rareness of most of the forms would permit. I am now able to state that, as regards Australian and New Zealand forms, the classification adopted by me, on imaginal characters only, has been fully tested in the case of the corresponding larvæ, with the result that these latter are found to group themselves into distinct families as readily as do the imagines, so that the two sets of characters taken together form a most useful and easily understood classification.

The most archaic forms of Perlaria extant are to be found in the genus *Eusthenia* and its allies. These have no close relationship with the Pteronarcidæ as defined in this paper, the latter being specialized by the reduction of the mandibles, the approximation of the coxæ of the forelegs, by the loss of the primitive paired abdominal appendages on segments 1–6, (secondary gill-tufts on the thorax and base of abdomen are developed in some genera), as well as by loss of the original palaeodictyopterous mesh-work or *archedictyon* in the anal area of the hindwing, and by the presence of a distinct break in the contour of the outer margin of the hindwing, at the distal end of Cu_2, where the anal fan leaves the rest of the wing. Thus the only primitive characters left to the Pteronarcidæ in common with the Eustheniidæ proper are the form of the tarsal joints, the visible clypeus and labrum and the presence of numerous cross-veins in the distal portions of the forewing. In contrast with this, all the true Eustheniidæ have a primitive larval form possessing five or six pairs of lateral abdominal appendages functioning as gills, on the first five or six segments of the abdomen, but no secondary gill-tufts at all. These primitive paired gills are closely similar to those found in the larvæ of certain archaic Calopterygidæ in the Order Odonata. They are carried over into the imago at metamorphosis, as are the secondary gill-tufts of *Pteronarcys*, but quickly shrivel up. In the imaginal stage, true Eustheniidæ possess an altogether complete set of archaic characters, as follows: In the forewing, a complete archedictyon or cross-venation in all parts of the wing, a complete set of cross-veins between Cu_2 and 1A, a radial sector with three or more branches, a first

cubitus with two or more branches, in most genera showing a primitive anteriorly-arching type of branching, and at least three complete anal veins; in the hindwing, the outer margin with a single complete convex contour, without any re-entrant break or angle at the distal end of Cu_2 (this character is unique for

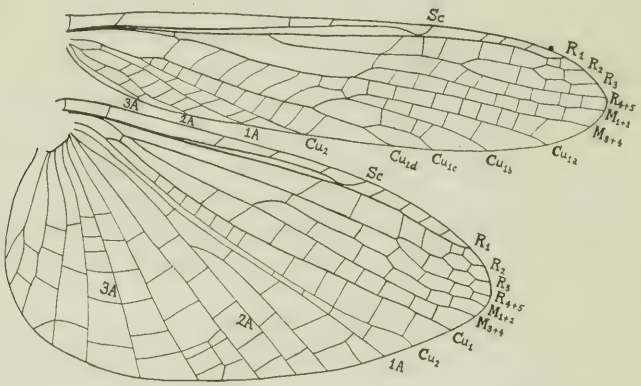

Fig. 1.—Venation of *Stenoperla prasina* (Newm.), family Eustheniidae, (New Zealand). The genus *Eusthenia* itself has broader wings and still denser venation.

the family), the radial sector branched, and the archedictyon completely preserved on the anal fan, as well as on the rest of the wing. (Text Fig. 1*). Other archaic characters are the form of the tarsal joints, the wide separation of the front coxæ, the presence of strong functional mandibles and a clearly visible clypeus and labrum.

Separated from these by clear characters, but still very archaic, are the genera *Austroperla* Needham and *Tasmanoperla* n. g. (type *Eusthenia diversipes*, n. sp.), which differ from the true Eustheniidæ in having shorter cerci, somewhat more reduced but still primitive venation, at least a partial fusion of M_{3+4} with Cu_{1a} in the hindwing, no archedictyon on the anal fan, and a distinct re-entrant angle on the outer margin at the distal end of Cu_2. (Text Fig. 3). In order to test the validity of this family, I sought carefully for larvæ of a different type from those of Eustheniidæ, and finally discovered in Tasmania a long cylindrical larva without any gills at all, and with rather short cerci, from which I reared a new species of *Tasmanoperla*, not yet described. Later on, I also obtained a closely similar type of larva from New Zealand, and reared from it *Austroperla cyrene* Newm. Thus the formation of this new family was fully justified.

Numerous species occur in which a considerable measure of specialization has set in, coupled with the retention of a number of archaic characters. These are all closely related to the genera *Leptoperla* of Newman (1839) and *Gripopteryx* of Pictet (1841). They therefore form the family Leptoperlidæ, this name replacing the name Gripopterygidæ used by Enderlein to include not only these insects, but also the Eustheniidæ and Austroperlidæ of this paper. Parenthetically, it may be remarked that Enderlein, in forming his family, entirely ignored

*An excellent figure of the wings of *Eusthenia spectabilis* Gray is to be seen in Comstock's "The Wings of Insects," (1918), p. 247, Fig. 246.

Newman's genus, and did not even give it a place in his dichotomic tables, though he must have known of its existence.

The characters that distinguish the Leptoperlidæ, as here defined, (Text. Fig. 4), are the loss of 1A in the forewing, leaving only two anal veins, 2A and 3A, of which the latter is always forked; the cubitus of the forewing either simple or once forked; the absence of archedictyon in the anal area of the hindwing; the presence of the re-entrant angle at the distal end of Cu_2; the presence in the hindwing of a fusion of M_{3+4} with Cu_1 for part at least of their lengths; the possession, as in Eustheniidæ and Austroperlidæ, of the archaic type of tarsal joints, mandibles, clypeus and labrum, and the widely separated front coxæ. In the larvæ, there is a unique development of a rosette of gill-filaments around the anus; no other type of gill is present.

There remain over only a few very reduced forms of Nemouridæ, found equally in Australia, Tasmania, New Zealand and Southern Chile, of which the genus *Udamocercia* End. contains at present the only described species. These are true Nemourids in the widest sense, the imagines having the cerci reduced to one joint, while the same is true for the larvæ, which also have no visible gills.

Owing to a fortunate meeting with Mr. Nathan Banks, of the Museum of Comparative Zoology at Cambridge, Mass., I have recently been able to discuss my plan of classification for the Notogæan Perlaria with him, and to learn from him more details of the morphology of those genera not represented in our Southern fauna than was possible with the limited material at my command. I wish here to express to Mr. Banks my very grateful thanks for a very illuminating discussion which I had with him, in which he clearly set forth the main characters of the various genera of the Northern Hemisphere, and pointed out what he considered the basic errors of accepted classifications. As soon as I had succeeded in convincing him that the Eustheniidæ and Austroperlidæ, as defined in this paper, had no close relationship with the Pteronarcidæ proper, the rest became "plain sailing," and we soon arrived at a complete scheme of classification which illustrates the phylogeny of the Order well, and at the same time offers excellent characters for the systematist.

The first point to be noted is that the old line of evolution which began with the Eustheniidæ and Austroperlidæ, is carried on by the Nemouridæ and Capniidæ. Both these families retain the original form of mandibles, clypeus and frons, while they also keep the primitive widely separated front coxæ. As regards their wing venation, both can be developed by further specialization from types found within the Leptoperlidæ; but the Capniidæ have progressed a point further than the Nemouridæ, in having lost the fork of 3A in the forewing. On the other hand, the Capniidæ have retained the original many-jointed cerci; while, in the Nemouridæ, these processes are reduced, both in larva and imago, to a single joint. Mr. Banks and I quite agreed that the elevation of the groups of *Taeniopteryx*, *Nemoura* and *Leuctra* to full family rank was not justified; and, in this paper, these groups are considered to be only subfamilies of the Nemouridæ.

The second point to note is that the two families Pteronarcidæ and Perlidæ (this latter including the Perlodidæ, which are at most only a subfamily of the Perlidæ) form an evolutionary sideline marked by certain high specializations

coupled with a primitive venational scheme, viz., reduction of the mandibles to a weak lamina, (in the case of *Perlidæ* followed by an inturning of the clypeus and labrum under the frontal shelf, so that neither of these parts is visible from above), and, in the larva, either absence of gills or replacement of the original segmental gill-appendages of the abdomen by secondary gill-tufts around the bases of the legs and on the first two abdominal segments. Within this complex, the Pteronarcidæ keep the more primitive form of venation, very similar to that of the Austroperlidæ; like these latter, they have lost both the archedictyon of the anal fan and also the original complete contour of the outer margin of the hindwing. They are also specialized in a unique manner by the approximation of the fore coxæ. On the other hand, the Perlidæ have a somewhat more advanced venational scheme, though some of the original cross-venation still persists in the Perlodinæ; the fore coxæ remain widely separated, but the joints of the tarsi become specialized, both first and second joints being very short, and the third much longer than both these two together. The Perlodinæ differ only from the Perlinæ in the more complete cross-venation of the distal portion of the wing, and therefore cannot be granted at the most more than subfamily rank.

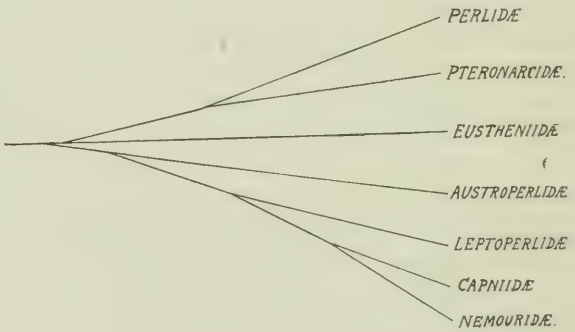

Fig. 2.—Phylogenetic diagram to show the relationships of the various families of the Order Perlaria. The Eustheniidæ are the remains of the original stock, without any specialized characters. The main line of evolution leads first to the Austroperlidæ, from them to the Leptoperlidæ, and culminates in the Capniidæ and Nemouridæ. From far back along the Eustheniid line, an evolutionary sidebranch gave origin to another distinct group, out of which arose the Pteronarcidæ and the Perlidæ.

The differences of the various families may be clearly set out in the following table, in which characters marked A are to be regarded as archaic, those marked B as specialized, while the addition of the letter U to either indicates that it is unique for the family. In the last line, the percentage of archaic characters present for the most archaic members of each family is calculated, the number so obtained giving a fairly reliable indication of the position of the family in the line of evolution. It should always be borne in mind that there are two culminating points for the family, viz., the Perlidæ on the one hand, as the end of a side-branch of evolutionary effort, and the Nemouridæ on the other, as the end of the main line of ascent of the Order. This idea is indicated in the Phylogenetic Diagram given in Text Fig. 2.

TABLE SHOWING PRINCIPAL CHARACTERS FOR THE FAMILIES OF THE ORDER PERLARIA.

Character	Family						
	Eustheniidæ	*Austroperlidæ*	*Pteronarcidæ*	*Perlidæ*	*Leptoperlidæ*	*Capniidæ*	*Nemouridæ*
(1) Mandibles:—A normal; B, reduced to lamina	A	A	B	B	A	A	A
(2) Clypeus and Labrum:—A, normal; B, hidden	A	A	A	BU	A	A	A
(3) Palpi:—A, with short joints; B, one or more joints elongated	A	A	A	B*	A	B*	B*
(4) Anterior coxæ:—A, wide apart; B, approximated	A	A	BU	A	A	A	A
(5) Tarsal joints:—A, 2 least, 3 longer than 1; B, otherwise	A	A	A	B†	A	B†	B†
(6) Cerci:—A, with 5 or more joints; B, reduced to a single joint	A	A	A	A	A	A	BU
(7) Outer margin of hindwing:—A, complete convex whole; B, with reentrant angle at distal end of Cu_2	AU	B	B	B	B	B	B
(8) Anal fan:—A, with cross-veins; B without	AU	B	B	B	B	B	B
(9) Cross-veins in distal half of forewing:—A, present; B, absent	A	A	A	A(B)	A	B	B
(10) Cubito-anal cross-veins in forewing:—A, present; B, absent	AU	B	B	B	B	B	B
(11) Branches of Rs in forewing:—A, 3 or more; B, 2 or 1	A	A	A	A(B)	B	B	B
(12) Branches of Cu_1 in forewing:—A, 3 or more; B, 2 or 1	A(B)	A(B)	A	A(B)	B	B	B
(13) Anastomosis or transverse cord:—A, absent; B, present	A	A	A	A(B)	A	B	B
(14) 1A in forewing:—A, present; B, absent	A	A	A(B)	B	B	B	B
(15) 3A in forewing:—A, forked; B, simple	A(B)	A	A	A(B)	A(B)	B	A
(16) Primitive paired lateral gills on abdomen:—A, present on segs. 1–5 or 1–6; B, absent	AU	B	B‡	B‡	B‡	B	B‡
Percentage of archaic characters§ for the most archaic members of each family	100	75	63	44	56	25	25

*In Perlidæ not as elongated as in Capniidæ and Nemouridæ.

†In Perlidæ, 1 and 2 very short, 3 greatly elongated; in Capniidæ and Nemouridæ, either 1 or 2 elongated.

‡In Leptoperlidæ secondary gills are developed as an anal rosette; in some Pteronarcidæ, Perlidæ and Nemouridæ, secondary gill-tufts are developed in various positions on the thorax or base of abdomen.

§In the table, I have not included the character of the presence or absence of fusion of M_{3+4} with Cu_1, or Cu_{1a}, in hindwing, as I have been unable to study the tracheation of larval wings in all families. It should be noted that this fusion is absent in Eustheniidæ, but present in both Austroperlidæ and Leptoperlidæ.

KEY TO THE FAMILIES OF THE ORDER PERLARIA.

(1) Anal fan of hindwing well formed, and with a complete archedictyon or original meshwork of cross-veins; the contour of the outer margin of the hindwing a single convex whole, without any re-entrant angle at the end of Cu_2.....*Eustheniidæ*, n. fam. (Text Fig. 1).
Anal fan of the hindwing without any archedictyon; outer margin of hindwing with a marked re-entrant angle at end of Cu_2.....2.

(2) Anterior coxæ closely approximated; cross-venation retained except on anal fan; mandibles reduced to a weak lamina.....*Pteronarcidæ*.
Anterior coxæ remain widely separated.....3.

(3) Mandibles reduced to a weak lamina; clypeus and labrum become hidden beneath frontal shelf; last joint of tarsi much longer than 1 + 2....*Perlidæ*.
Mandibles, clypeus and labrum remain normal; last joint of tarsi not longer than 1 + 2.....4.

(4) In forewing, three anal veins are present, 1A running very close to Cu_2.....*Austroperlidæ*, n. fam. (Text Fig. 3).
In forewing, 1A is eliminated, leaving only 2A and 3A, the latter forked or simple.....5.

(5) In both wings, no true anastomosis connects the main veins from R to Cu_1 near middle of wing; cross-veins are always present in the distal portion of the wings.....*Leptoperlidæ*, n. fam. (Text Fig. 4).
A true anastomosis or transverse cord is always present, connecting the main veins of both wings from R to Cu_1; cross-veins not usually present distad from the anastomosis.....6.

(6) (In forewing, 3A is forked; cerci are vestigial, being reduced to a single joint.....*Nemouridæ*.
In forewing, 3A is simple; cerci remain long and many-jointed.....*Capniidæ*

FAMILY AUSTROPERLIDÆ.

Tasmanoperla, n. g.

(Text Fig. 3).

Allied to *Austroperla* Needham, from which it differs only in the following points:—

Veins of the forewing very strongly marked, cross-venation very prominent, (*Austroperla* has the cross-venation weak, especially in the distal half of the wing, where the cross-veins are not easy to see in most specimens). In the forewing, 1A diverges from Cu_2 slightly, then converges towards it distally; (in *Austroperla* 1A lies very close to Cu_2 throughout, and is a much more weakly formed vein). Forewing considerably narrowed at the base, without any clearly marked anal angle; (in *Austroperla*, the forewing has a definite anal angle, distad from which the posterior margin runs almost parallel with the costal margin of the wing).

Genotype.—*Eusthenia diversipes*, n. sp. (Tasmania).

Tasmanoperla diversipes, n. sp.

(Text Fig. 3).

No description of this species appears ever to have been published, although the name is mentioned in literature by Walker and others. It would seem probable that Westwood had made a MS description, from which the name was taken and used in print, without any corresponding description. The species is closely allied to *Eusthenia thalia* Newm., 1839, from which it may be distinguished as follows:—

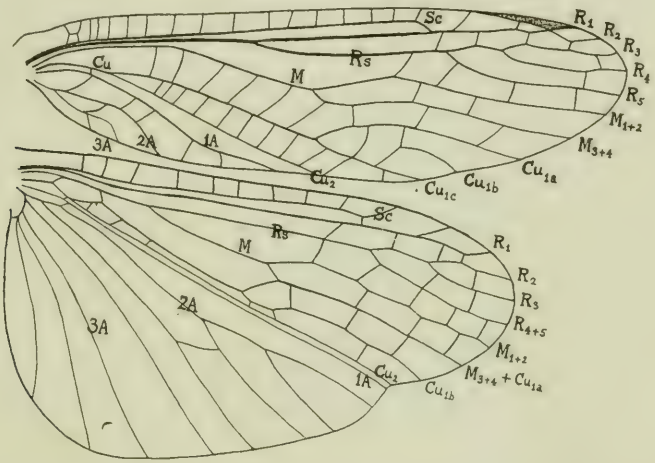

Fig. 3.—Venation of *Tasmanoperla diversipes* n. g. et. sp.; family Austroperlidæ.

Wing-veins brown, the costal veinlets of the forewing, and the distal ends of the main veins of both wings around the apices marked with small dark patches. Forewings very irregularly irrorated with brown, but a clear, unshaded patch of irregular shape is left at one-third from apex. (*E. thalia* Newm. has the forewing of a dark smoky colour, with a very clear and more regular, somewhat cream-coloured patch left unshaded in about the same position). Legs black, with rich brown marks at the bases of the femora and tibiæ; the brown on the hind femora occupies the basal half.

As in *E. thalia*, the wings are slightly shorter than the abdomen, the cerci rather short, the antennæ shorter than the forewing, and the prothorax absolutely square in shape.

Type.—Holotype female, in Coll. Tillyard.

Locality.—Mount Wellington, Tasmania, Jan. 31st, 1917.

This species is made the type of the genus *Tasmanoperla* as it is the one which I have studied and figured. I have, however, seen specimens of *E. thalia* Newm., and there can be no doubt that it also must be placed in this genus.

Family Leptoperlidæ.

Note on the Type Specimen of Leptoperla Beroe Newm.

(Text Fig. 4a).

The venational characters of *Leptoperla beroë* Newm., which is not only the type of the genus, but also the first Leptoperlid ever described, were not clearly given by Newman. The type is in the Hope Museum, Oxford. By the kindness of Professor Poulton, F. R. S., I was recently able to study this specimen carefully. Text Fig. 4 shows the venation of the right forewing, which has a peculiar aberrancy in that the two branches of M come together and fuse for a short space, and then separate again distally. The left forewing and both hindwings are much rolled and crumpled, the specimen being gummed on card. By softening these wings with warm water, and uncurling them with a fine brush, I was enabled to prove that the left forewing possesses a normal venation, with both branches of M running free and parallel to their tips. The following diagnosis for the genus may now be given:—

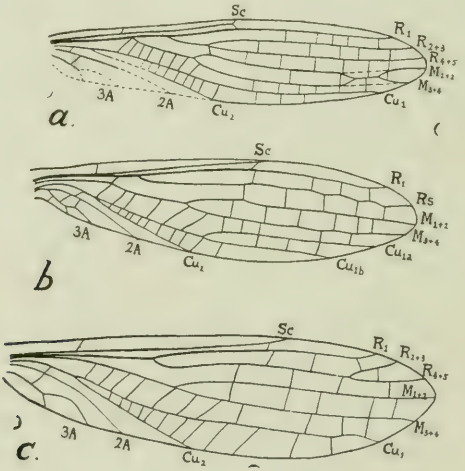

Fig. 4.—A. Right forewing of type specimen of *Leptoperla beroe* Newm. The normal courses of the branches of M, and the form of the crumpled anal area, as revealed by a study of the damaged left wing, are shown by dotted lines.
B. Right forewing of a specimen of *Dinotoperla opposita* (Walk.) from Mount Wellington, Hobart, Tasmania.
C. Right forewing of *Zelandobius confusus* (Hare) paratype, from Wellington, New Zealand.

Antennæ and *cerci* long, the latter considerably longer than the abdomen. *Forewing* with Sc stopping just short of half-way, its tip forked. Rs and M both forked not far from their origins, Cu_1 unforked and very long, running to the same level below the apex of the wing as that at which R_1 ends up above it. Complete sets of cross-veins between M and Cu_1 and also between Cu_1 and Cu_2. 2A simple, 3A forked. Irregular cross-veins enclosed in pale, oval spaces occupy positions in the distal half of the wing; (the wing membrane generally is of a brownish colour). *Hindwing* with Sc as in forewing; Rs simple; M with a free upper branch, and with its lower branch fused with Cu_1 to the border; Cu_1 simple; anal fan with five straight veins excluding 1A. (Cross-veins present

in hindwing are the humeral, an oblique one connecting R_1 with Rs towards half-way, and two connecting Cu_2 with the fused vein above it in its distal half).

The locality for this species is Tasmania. Though I have collected carefully in many places throughout the island, I have never met with it. The common Leptoperlids of Australia, Tasmania and New Zealand do not belong to this genus.

Dinotoperla, n. g.

(Text Fig. 4b).

Cerci shorter than the abdomen. Third joint of tarsus slightly longer than basal joint. Forewings with Rs simple, Cu_1 deeply forked, and complete sets of cross-veins between M and Cu_1, and also between Cu_1 and Cu_2. Hindwing with only slight fusion between M_{3+4} and Cu_1, and with the anal fan narrower than the rest of the wing at the end of Cu_2.

Genotype.—*Leptoperla opposita* Walker, Tasmania.

This genus differs radically from *Leptoperla* Newm. in its much shorter cerci, its longer distal joint of the tarsi, in the loss of the fork of Rs and in the retention of the fork Cu_1. It is closely related to *Gripopteryx* End. and *Paragripopteryx* End., from South America (these two genera are barely distinct), but can be at once separated from them by the unforked Rs of the forewing and by the possession of the complete series of cross-veins between M and Cu_1.

A number of undescribed species of this genus occur in Australia and Tasmania.

Zelandobius, n. g.

(Text Fig. 4c).

Allied to *Gripopteryx* End. and *Paragripopteryx* End. from South America, but distinguished at once from them by possessing a simple Cu_1 in forewing and a wide anal fan in the hindwing, as well as by the retention of the complete series of cross-veins between M and Cu_1 in forewing. Rs is distally forked as in *Gripopteryx* and *Paragripopteryx*.

Genotype.—*Leptoperla confusa* Hare, New Zealand.

Leptoperla hudsoni Hare also goes into this genus, but *L. fulvescens* Hare and *L. maculata* Hare belong to *Aucklandobius* End. All these species are from New Zealand.

Zelandobius differs from *Aucklandobius* in having Rs distally forked in the forewing, and the fusion of M_{3+4} with Cu_1 not complete in hindwing. *Aucklandobius* differs from *Antarctoperla* End. chiefly in its much wider anal fan and in the complete fusion of M_{3+4} with Cu_1 in hindwing.

Both *Zelandobius* and *Aucklandobius* are represented in New Zealand by a number of undescribed species. The *Leptoperlidæ* of South America are evidently closely allied to those of New Zealand and Australia, and a knowledge of all the forms is necessary for the study of those in any one region.

Explanation of Text Figures.

1A, 2A, 3A, first, second and third anal veins, respectively; Cu_1, first cubitus, with its branches Cu_{1a}, Cu_{1b}, Cu_{1c}, Cu_{1d}; Cu_2, second cubitus; M_{1+2}, M_{3+4}, the two branches of the media; R_1, radius; Rs, radial sector, with its branches R_2, R_3, R_4, R_5; Sc, subcosta.

A NEW SPECIES OF COPTODISCA. (LEPID.)

BY WM. G. DIETZ,
Hazleton, Pa.

Coptodisca kalmiella, n. sp.

Size minute. Head, palpi and antennæ silvery gray, the latter long. Fore-wings golden-brown from the base to about the middle of their length, passing gradually into golden yellow; a silvery, triangular band-like spot at about two-thirds the wing length, on both the costal and posterior margins, the apices of which nearly meet on the disk, and margined proximally and distally with black. Cilia nearly double the width of the wing, traversed by the bases of the black-margined silvery spots, a black costal stria before the apex; a trapezoidal black spot in basal two-thirds of the cilia, at the apex, surmounted by a black line extending to the edge of the cilia; basal two-thirds of dorsal cilia in apical third with two broad, concentric lines separated by a pale line of the ground colour; proximad to this is a brownish tuft, from base to free margin of cilia; rest of cilia, a brownish gray. Hind wings very narrow; cilia about three times their width. Legs and body, silvery gray.

Habitat.—Browns Mills, N. J., mining leaves of *Kalmia angustifolia.* Collectors, H. B. Weiss and C. S. Beckwith, June 22 to June 30. Type and paratypes in collection of H. B. Weiss.

NOTES ON COPTODISCA KALMIELLA DIETZ, A LEAF MINER OF KALMIA ANGUSTIFOLIA.

BY HARRY B. WEISS AND CHARLES S. BECKWITH,
New Brunswick, N. J.

This microlepidopteron first attracted our attention at Brown's Mills, N. J., by its work on the leaves of sheep laurel (*Kalmia angustifolia* L.) which were observed to be full of small oval holes. Closer observation revealed mines inhabited by lepidopterous larvæ and upon rearing them, we secured a species of *Coptodisca* which was kindly described by Dr. W. G. Dietz as *kalmiella.*

The mines of this species are irregular and blotch-like, extending from the midrib almost and sometimes entirely to the edge of the narrow leaf. They are visible on both sides of a leaf, more so on the upper where they appear as reddish brown, dry areas partly filled with excrement. The number of mines in a leaf varied from one to twelve. Twenty-nine leaves were found to average five mines to a leaf. In some leaves many of the mines ran together and took up most of the leaf surface. Leaves on all parts of the plants were infested, especially terminal ones.

During the last week of May many mines were found to contain full-grown larvæ, and many were empty. From this it appears as if the larvæ over-wintered in the mines and that our observations started just as the larvæ were leaving. When full grown the larva cuts an oval case (3 mm. long; 1.6 mm. wide) from a part of the mine which is free from excrement, this case consisting of the semi-transparent upper and lower leaf surfaces which are fastened together. This oval case is regular in outline with a clean cut edge. When the oval is completely cut, the case containing the larva either drops to the ground or the larva crawls to the tip of a leaf pulling the case after it, and finally drops

to the ground after hanging a short time suspended by a thread. Once on the ground the larva crawls under fallen leaves, etc., and pupates within the case, this stage requiring from two to three weeks, the moths appearing about June 20 and being plentiful a week later around sheep laurel in the field. In order to facilitate the emergence of the moth, the pupal case projects slightly from the oval case. It is not known how many broods occur in New Jersey. Probably the over-wintering larvæ are those which hatch from eggs deposited during July.

Kalmia angustifolia L., is frequent in sandy ground, especially around the edges of bogs in the pine barrens and often covers large areas. In view of this, the miner should be found in many other localities in the pine barrens. Dr. Dietz writes that he has bred this species in numbers from sheep laurel collected in Pennsylvania and has noted as many as twelve to fourteen mines in a single leaf.

Full-grown Larva.—Length 3.4 mm. Width 0.5 mm. Head and first two segments brownish, remainder of body white with greenish tinge, somewhat translucent; elongate, tapering slightly posteriorly; body notched at sides, flattened dorso-ventrally; head small, mouth-parts dark, first thoracic segment longest, second and third thoracic segments subequal in length; abdominal segments subequal in length except in the ultimate and penultimate which combined approximate the length of the preceding segment; first thoracic segment not quite as wide as the second and third which are subequal in width; abdominal segments subequal in width except the last three or four which are narrower; prothorax bears a dorsal, dark spot which covers most of the surface; dorsum of meso- and metathorax bears a somewhat similar dark area each with separated, subcircular light areas. First seven abdominal segments bear irregular, oval, ill-defined dark areas; dorsal markings of eighth abdominal segment somewhat similar to those on dorsal surface of metathorax, the subcircular light areas may be fused or only slightly separated; dorsal surfaces of remaining abdominal segments may bear indications of dark areas or be entirely light; ventral surface and markings similar to those of dorsal surface except that the dark areas on the third, fourth, fifth and sixth abdominal segments are replaced by dark, oval rings; head and sides of each thoracic segment bear several fine hairs; a single hair on side of each abdominal segment; dark areas appear to be finely shagreened; shagreening on prothorax more pronounced.

Another lepidopterous miner of sheep laurel was described by Dr. Dietz in 1907 (Tr. Am. Ent. Soc. XXXIII, p. 291). This is *Ornix kalmiella*, the larva of which makes a pale, orange coloured, blotch-like mine in the upper side of a leaf. The localities for this species as given by Dr. Dietz are Pa. and Conn., larvæ, August and September; adults, following May.

CHANGE OF ADDRESS.

As from 1st January, 1921, the permanent address of the Publication Office of the Imperial Bureau of Entomology will be 41 Queen's Gate, London, S.W., 7. All communications respecting subscriptions to or exchanges for the Review of Applied Entomology and Bulletin of Entomological Research or to the Bureau Library, should be sent to the Assistant Director at above address.

PSEUDOMACROMIA NATALENSIS AND MERUENSIS (ODONATA).

BY S. G. RICH,
Durban, Natal, South Africa.

The present paper arises from the peculiarities of a specimen of *Pseudomacromia* collected by me at Edendale, Natal, on Nov. 12, 1918, and now in my collection. The specimen is a female, measuring abdomen including appendages 40 mm., hind wing 43 mm., fore wing 43 mm., both pterostigmas 3 mm.

The specimen has the following features of interest. Lower lip yellow brown on side lobes, with centre lobe black and a black rim on the mesal edge of each side lobe. Upper lip bordered with very dark brown. Across frons immediately above lip, a dull greenish band about 1 mm. wide. Top of frons steel blue. Vertex brown, with traces of steel blue. Both wings flavescent from beneath stigma mesally, the fore wing until one cell from nodus, the hind wing half way to nodus; this is a vague cloudy flavescence except at the costal border of the fore wing. There is a very faint flavescence extending to the first cross-vein under the subcosta and the cubitus of the fore wing, and a stronger flavescence in the same place and four cells closest to the membranule in the hind wings. The abdomen has the first two segments yellow-brown with a thin, black band, marking the end of segment 2; segment 3 has a thin-lined yellowish cross on the back, on an otherwise dark ground; the other segments are dark brown with narrow, dull yellow markings along the sides. The membranule of the wings is grayish, becoming cream-coloured at its costal end.

Barring the head details and the basal flavescence of the fore wing, the specimen agrees with Martin's original description of *P. natalensis* female (Bull. du Museum d'Histoire Naturelle, 1900, p. 106).

In the Selys Catalogue, Fasc. XIV, p. 805, there is given in brackets the species *P. meruensis*, from Kilmandjaro, East Africa. This, described as *Homothemis meruensis* by Sjostedt, 1909, was not in the Selys collection, but Dr. Ris quotes the original description and assigns it to the genus *Pseudomacromia*. The present specimen agrees equally with this description, more especially as to the lips, frons, colouring of legs, and wing-flavescence. The dimensions are as in this description.

In view of the fact that the description of *P. meruensis* is based upon a single specimen, and that no others of this species are recorded in the Selys catalogue, I am strongly of the opinion that the two species are identical. *P. natalensis* is recorded from as far north as Macequece, Portuguese East Africa, in the Selys catalogue, and it is not unreasonable to expect that it would be found in the highlands of East Africa nearer the equator.

Martin's original description of *P. natalensis* is, except for the lips, and the cross-mark upon the back of the abdomen, identical with Sjostedt's of *P. meruensis*. The synonymy of these two species may be taken as highly probable, if not established.

It may be of additional value in this connection to mention the characteristics of a specimen of *P. natalensis*, in the collection of the Durban Museum, Natal. The specimen is a female, taken at Umbilo, one of the suburbs of Durban. It agrees with my specimen in possessing all the features which would show the identity of *P. natalensis* and *P. meruensis*. The flavescence

on the wing is somewhat fainter than in mine, but in the fore wing extends from the stigma to the nodus, and in the hind wing covers some seven cells close to the stigma only. The basal flavescence is as in mine. The dull green band across the frons is more prominent.

The two specimens have femora that answer to the description of either species: the first and second femora light brown, the third darker, but light brown at the base.

In both specimens the claws are not alike throughout. In each case approximately half of the claws have the lateral spur of the same length and breadth as the tip of the claw proper, and the remainder have the spur slightly thicker. *P. meruensis* is described as having the spur similar to the tip; *P. natalensis* (in the Selys catalogue) as having the spurs thicker.

The pterostigmas of the museum specimen are all 2.3 mm. long; in mine they are .5 mm. longer.

There is every evidence that the two are of the same species; yet the museum specimen is clearly *P. natalensis* and mine may be *P. meruensis* equally as well, according to description. The identity of the two species, as stated above, appears highly probable, if not fully proven.

A NEW RACE OF *STRYMON MELINUS* HBN.

BY J. McDUNNOUGH, PH.D.*
Entomological Branch, Ottawa.

Strymon melinus atrofasciata, var. nov.

♀.—Upper side rather deep slaty-gray with maculation similar to that of the Eastern race (*humuli* Harr.). Beneath even slaty-gray with no tinge of brown, the post-median row of spots heavy, black, especially prominent on secondaries; these spots are bordered outwardly with white but show practically no traces of orange colour on their inner margin. The subterminal maculation is the same as in the type form with the orange spots very bright in colour.

♂. Similar to ♀, but slightly darker on upper side with ground colour on both sides showing a faint brownish ringe.

Holotype.—1 ♀, Wellington, B. C., (July 12th, 1904), (G. W. Taylor), in Canadian National Collection.

Allotype.—1 ♂, Duncan, B. C., (C. Livingston), in same collection.

Paratypes.—2 ♀'s, Royal Oak, B. C., (May 26th, 1917), (R. C. Treherne); Victoria, B. C., (May 21st, 1917), (A. E. Cameron), in Canadian National Collection.

The above race, characterized by its dark ground colour and heavy black spotting on under side with lack of orange margin to spots, seems confined to Vancouver Island. It bears apparently a certain relation to *pudica* Hy. Edw. in this lack of orange, but this latter race is described as having the lower side "more silvery grey" than *melinus* with obsolescent maculations whereas the heavy black maculation of the underside in the present race is a feature that at once strikes the eye.

*Contribution from the Entomological Br., Dept. of Agr., Ottawa.

THE LARVA AND BREEDING PLACE OF *AEDES ALDRICHI* DYAR AND KNAB. (CULICIDÆ, DIPTERA).

BY ERIC HEARLE,
Dominion Entomological Laboratory, Mission City, B. C.

Aedes aldrichi is the dominant mosquito in the Lower Fraser Valley, B. C., and the main cause of the serious mosquito pest that at times occurs in that district and casts an evil shadow over the most beautiful period of the year. Previous to the summer of 1920, the larva had been unknown and there were no definite data as to its breeding place. Extensive larval collections have shown the main breeding places to be in the wooded river bottoms. These areas are thickly covered with cottonwood and a tangled low growth of willow, rose and spiræa. They are locally known as alder-bottoms. At freshet time flooding converts them into temporary swamps capable of producing enormous numbers of mosquitoes. *Aedes vexans* and *Aedes cinereus* occur with *Aedes aldrichi* in these alder-bottom areas, but the latter is the chief species.

Description of Larva of Aedes aldrichi.

Stage IV.—A stout dark grey larva, very much like that of *Aedes hirsuteron* and *Aedes aestivalis*, from which it differs mainly in the dorsal head hairs and, in the case of *hirsuteron*, in the laterals of the sixth abdominal segment.*

Head with a dark patch on the vertex; broad, narrowed before the eyes; front roundly arcuate. Antennæ, inserted at notch in head, yellowish, moderate, curved, swollen at base, fairly thickly covered with large and small spines; antennal tuft of about seven hairs of moderate length placed a little before centre; at the apex are four short spines, one long spine and one short bud-like process. Eyes transverse and pointed. Upper pair of dorsal head hairs usually in twos and lower head hairs single; ante-antennal tuft of about seven hairs. Mental plate broadly triangular with a small, central tooth and fourteen to seventeen teeth on each side, those toward base largest. Thorax rounded, wider than long, hairs abundant and fairly long. Abdomen stout, anterior segments shorter and broader, hairs sparse, laterals moderately long, secondaries short; laterals usually double from second to sixth segment, but often in threes on third segment; first segment with two pairs of fairly long hairs. Air tube stout, about three times as long as wide; pecten of about seventeen evenly spaced teeth reaching to middle; teeth gradually larger distally; individual tooth a long spine with broad base, a stout spine at base and a very small tooth between this and the main spine; a tuft of six hairs following the pecten. Lateral comb of eighth segment of about twenty-five scales in a broad triangular patch; scales three deep; individual scales broadly elliptical, fringed with short delicate spines from centre outwardly, a longish stout spine at apex. Dorsal plate reaching nearly to ventral line. Dorsal tuft a brush of about eight hairs and one long hair on each side. Ventral brush well developed. Anal gills ensiform and about twice as long as eighth segment. Skin of larva covered with minute spicules.

*Note.—A great deal of variation occurs and a good series is needed to ensure accurate determinations. The dorsal head hairs are not very constant. In many cases the upper dorsal head hairs are in threes and the lower head hairs in twos, sometimes they occur in fours and in threes, but in only a very few specimens examined were the upper head hairs found to be single as in *aestivalis*. In many specimens some of the abdominal laterals were found to be in threes, but the sixth laterals are always paired, unlike those of *hirsuteron*, in which they are single.

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POPULAR AND PRACTICAL ENTOMOLOGY.

The Life-History of a Hobby Horse.

by francis j. a. morris,
Peterborough, Ont.

Part II.—Boy and Man—Sapling Growth.

(Continued from page 28, Vol. LIII.)

Long before Slyboots went abroad, a new element had begun to enter into our lives which made itself specially felt in our dealings with Nature—the joy of memory and past associations. This seemed to grow quite independently of the rapid waning of novelty from our environment and out of all proportion. I can remember how my brother and I both lamented that while going back to Scotland seemed to give us unspeakable thrills of pleasure, no such inspiration came from trips in England. It puzzled us both at the time, but I have no doubt now that it was due to the countless happy memories awakened in us by the sights and sounds of childhood's home; just as soon as we crossed the Tweed at Carlisle, and heard the names of the stations shouted in good broad Doric. My brother never stayed in England long enough for these stored-up treasures of the senses to be converted into memories, but I am happy to think and to bear testimony to what I suppose is a universal human experience, that I can call these sweets of life to-day not only from our native heath of Scotland, but from many an English lane, aye! and from half a hundred sunny scenes of old Ontario.

This fondness for revelling in memory, it seems to me, grew very fast after Slyboots went abroad, till it became a passion for the old familiar things. It was then almost certainly for that reason that the charm of recurring seasons first laid hold upon me and a hungry craving for the Spring. It had always been living things that drew me, or things that once had lived (like fossils of the chalk) and now bore mute witness through the ages to the far-off day of their pride; and I came to yearn for signs of life's renewal on the earth. Autumn and winter were the dead seasons, but how eagerly I watched for the rathe primrose and the springing violet! with what exultation I caught the earliest call of the cuckoo and the first skimming flight of the migrant swallow! The coming of Spring made the heart gush as though it too had been for months fast held in winter's icy clasp.

I was much given to long, solitary walks. To wander land and meadow, woodland and moor, mountain and glen, was an exquisite pleasure that thrilled the very soul; all day long, no doubt, on these tramps, I was drinking in countless sights and sounds, landscape mellowed in the distance, soft hues of foliage, a hundred flowers and ferns and birds, the murmur of pines and running water, the cooing of the stock-dove and the song of the Skylark; but I was rarely con-

scious, except in the first days of early Spring, of the individual notes of colour and music and fragrance that blended in these hours of happy reverie.

Wherever I went, seemingly, I must first make myself acquainted with any new feature of living Nature that came within my ken, be it insect, bird, or flower, before I could give myself over to the contemplation and enjoyment of earth. But once the new had become the familiar, I was satisfied, and fell back on the old pleasures of memory and association. Thus the first two years of my residence at Oxford kept me busy with the surface fossils of the stone-brash; repeated visits must be made to Iffley to see the wonderful fritillaries in bloom, trips taken up the Cherwell at the season of the cowslip, and whole days spent haunting the edge of Wytham Wood for the enthralling song of the nightingale; the same with first days in Buckingham and Worcestershire, in Somerset and Devon. New discoveries brought keen pleasure and delight, but these were as nothing to the ecstasy of revisiting; when the novelties had been caught up in a network of associations, and their beauty enhanced a thousandfold by the host of memories they awakened, all bathed in a subtle atmosphere of emotion. And perhaps of greater value still for the mind in its maturing, were the hours of conscious meditation and reflection on Nature and life, for which all this raw material of observation was, I must believe, an instinctive preparation.

There comes to most of us in the exuberance of youth, a day when we are impatient of all tradition, and even feel guilty of a certain dishonesty in the placid acceptance of current opinion. I was about sixteen when the eternal riddle of existence first propounded itself to me, and none of the conventional readings brought satisfaction or peace of mind. This was a year after my brother went abroad, the first summer holidays spent in Scotland without his companionship. Our host was always the same, an old army doctor whose acquaintance we had first made shortly before my father's death. He had lectured at Netley, seen service in India, and returned to his native Scotland on retirement. Bred up a staunch old Presbyterian, and by nature a rigid moralist and strict disciplinarian, he was yet a man of great tolerance, quite free from dogma, and generous in his sympathies; a great reader (though shy of fiction and poetry alike), open-minded and of liberal view, a scholar and a scientist, he was, as you may easily understand, a believer in evolution and an ardent disciple of Darwin.

I cannot enough admire our host's patient forbearance with his two school-boy guests and their sad lack of seriousness. On our first visit to him after settling in the south of England, a prolonged spell of bad weather (coupled in Slyboots' case with a touch of bronchitis)prevented us from going out very much, and we made almost daily raids on the village library for story books. My favorite author was Ballantyne, my brother's was Kingston, but neither of us had the remotest idea of how or why his favorite author made such a strong appeal to him. I fancy the doctor must have been aching to see us tackle something better worth while, but he never interfered and apparently even gleaned no small amusement from some of our frequent disputes; for I can still hear his guffaw over what I fondly imagined a shrewd stroke of mine at the close of a battle royal with Slyboots: "Well! if Slyboots would have it, the reason I liked Ballantyne best was because he gave you more for your money; there were whole chapters at the end of Kingston, and sometimes even in the

middle of the book, wasted over footling love affairs, when the hero might have had at least one more hair-raising adventure in the forests of Brazil, the Indian Jungle, the African veldt, or wherever it happened to be."

At sixteen I had outgrown these boys' books and was ripe for more substantial reading. It so happened, too, that in the previous term I had heard quite a lot about Darwin and the Theory of Evolution. It formed a subject of discussion among schoolmates on the Science side, who were actually divided into two rival camps under the leadership of this master and that, known to favour or to scout the doctrine; a special hero of my schoolboy worship, some years my senior and a prefect in the house where I spent my first few months of attendance at Dulwich College, had recently paid me a visit from Guy's Hospital in his first year as a medical student, and from him I learned some outlines of the theory; it had even been debated in my hearing at home by an elder brother in conversation with a business friend; and so it came about that the idea of Evolution figured quite prominently in the almost daily thoughts of a classical student of sixteen; and it was in answer to a question of mine that the good doctor first broached the subject and explained to his young guest as clearly and simply as might be the nature and trend of that world-revolutionizing treatise, Darwin's "Origin of Species."

And in a very few days, as it seemed, the solitary boy of sixteen with his time-old mystery of life, found sympathy and help as well as companionship in his host of nearly sixty. The doctor was very methodical and kept a series of logbooks or diaries in which he entered a summary of everything he read, even to magazine articles; these notebooks he called his "omnium gatherums." He had not a large library, as most of his reading was done by way of periodic parcels of books from Edinburgh, kept for two or three months and then exchanged. But he had a little bookcase of favorites, and after suggesting some volumes to be read in a certain order, he gave me the run of the shelves. I first read round the theory in three or four books like Robert Chambers' "Vestiges of Natural Creation," Lauder Brunton's "Bible and Science," and Samuel Laing's "Modern Science and Modern Thought;" I was then made to tackle, just as soon as I seemed ripe for it, Darwin's "Origin of Species" and "Descent of Man;" and after these came a troop of his great exponents, Huxley, Wallace, Romanes, Grant Allen, and Lubbock. When once I had assimilated some of this thought, I was promoted from the Doctor's exposition to the give-and-take boxing bouts of argument and discussion. Long before I passed from school to the university, I was as thorough-going a Darwinian as the old doctor himself and even more advanced, partly from the natural insolence of youth, and partly from wide reading in the noblest literature of all ages and lands, the fearless freedom of Greek poet and philosopher.

Together as men and equals we read and discussed Weismann and Haeckel, or shook our heads sadly over the unsoundness of Wallace's closing chapters on "Darwinism" with their "*deus ex machina*" of Spiritualism. When Huxley tilted with the clericals in the pages of the XIXth Century Magazine, we both keenly admired the skill with which he found the joints of the mediaeval armour and unhorsed his cumbrous opponents; a "bonny fechter," like Alan Breck, was that brilliant pamphleteer, and a tower of strength to the good cause, as we viewed it, of untrammelled thought—the march of Science. Unlike the

dear old doctor, my host, I had a great liking for fiction and was passionately fond of poetry; the great problem novels of the day, and indeed more recent books of mark I devoured with keep appetite, and was never tired of conning the pages of my favorite poets—Burns, Keats, Shelley, Rossetti, Swinburne and Matthew Arnold.

One great boon, I am sure, I owed to this course of systematic reading in Science. It added an intellectual interest to my long walks in solitary communion with Nature. For the habit of lonely wandering that I had formed on Slyboots' departure cannot have been entirely wholesome; there was hardly a sight or a sound in the world that did not awaken some chord of memory, and I often brooded over the past, though with more of wistful reverie than of sorrow in my mood. But as soon as the interest of this new theory took hold of me, it gave me a new outlook on Nature, and instead of brooding inwardly, my thoughts went out to Natural objects in search of illustration, to test book-theories as it were, and in this channel of activity they found a healthy and cheerful outlet.

More and more, it became a delight to mark the characteristic beauties of English scenery; the deep luxuriant lanes, the floral treasures of hedgerow and meadow, of riverbank and stream; the glories of the beech woods and groves of oak; the distant views of the breezy downs, and the wild grandeur of the Wessex moors. But always the crowning glory of the year, when Spring had blossomed into Summer, was the visit to Scotland. My favorite haunt, growing dearer season by season, was a mountain stream in the neighborhood of Bridge of Allan. Whether I took my fishing-rod or not made little difference, nor what direction I started out in; all paths seemed at last to lead to the mouth of the Wharrie burn where it merged in the river Allan, and then came an all-day tramp, up through the woods, past cataract and linn, climbing the steep glen by mossy rocks, past rowan and birch, out on to the open moor and then over the heather, till I had tracked the baby stream to its cradle in a mountain tarn, below the peaks of the everlasting hills.

As soon as I entered the University I began to gather a library for myself. One of the most treasured shelves was devoted to books of scientific theory; I made a selection of volumes from the International Scientific Series published by Kegan Paul, and became a subscriber to two new series—the Minerva Library of Famous Books, edited by G. T. Bettany, and the Contemporary Science Series published by Walter Scott; every volume of these two publications I purchased on issue and devoured at my leisure.

But my interest in Evolution never for a moment lessened the love of Natural objects or dulled the sense of mystery, of wonder, and of beauty in God's handiwork. And this emotional attitude to Nature was greatly strengthened in my student days at Oxford by a wonderful discovery that I made at the end of my second year. While travelling in the realms of gold I found that I was not alone or peculiar, had nothing to be ashamed of, in my solitary musing on the mystery of life. I found the most secret thoughts and feelings of my very soul from boyhood to manhood laid bare and given a language in two books that have been a bible to me ever since, the Poems of William Wordsworth, especially Tintern Abbey, and Richard Jefferies' Story of My Heart.

NEW BRITISH COLUMBIA TUSSOCK MOTH, HEMEROCAMPA PSEUDOTSUGATA.

BY J. McDUNNOUGH, PH. D.
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For the past few years a species of tussock-moth has been reported as damaging the douglas fir in certain districts of British Columbia; it was determined by Mr. E. H. Blackmore in the Report of the British Columbia Provincial Museum, 1918, p. 12, as *Hemerocampa vetusta gulosa* Hy. Edw. and a figure of a rather rubbed ♂ was given on Plate 1.

An account of the extent of the devastation was also given by Mr. W. B. Anderson, in the Agricultural Gazette, 1919, VI, 139.

In the spring of 1920 I received a number of egg-masses of the species, collected by Mr. W. B. Anderson, the original discoverer, at Chase, B. C. From these I was enabled to breed a limited number of adult specimens; the young larvæ on hatching were offered hemlock and pine, douglas fir at the time not being available; a large number refused to eat and perished, but a few nibbled the blossom-buds of hemlock and fed on these until half-grown when they were transferred to douglas fir, a tree of this species having been located at the Experimental Farm. The moths emerged in the first week of July during my absence from Ottawa, an earlier date than that given by Mr. Blackmore in his account of the species, but probably due to more or less forcing of the young larvæ during the early spring.

From my present knowledge of the early stages and of the adults I cannot agree with Mr. Blackmore that the species is *gulosa* Hy. Edw. This species was described in Papilio I, 61, in a paper by Mr. Edwards dealing with the Pacific Coast species of *Orgyia* (*Hemerocampa*). In this paper *vestusta* Bdv., a species described very briefly from a ♂ specimen from California which is possibly still in the Oberthur Collection at Rennes, France, and which has certainly never been satisfactorily identified by American systematists, was limited to a lupine-feeding larva of the San Francisco Bay region, whilst the name *gulosa* was proposed for an oak-feeding larva which was found abundantly throughout the foot-hills of the northern Sierras. Both larvæ were described rather inaccurately and inadequately; roughly speaking, apart from the difference in food-plants, the main points of distinction are apparently to be found in the color of the dorsal abdominal tufts; in *vetusta* the tufts on abdominal segments I-IV are described as being whitish drab at base tipped with chestnut-brown; in *gulosa* tuft I is blackish, the other three tufts being white; the dorsal tuft on segment VIII is yellow tipped with black in *vetusta* and black in *gulosa*.

In Psyche VI, 438 (1893) Dr. H. G. Dyar gives a detailed description of the early stages of *gulosa*; his description of the 3rd and 4th larval stages corresponds well with Edwards' larval description; in full grown larvæ Dr. Dyar states of the tufts that they are "coloured a silvery-grey, in some specimens blackish or even black on the crests, but white on the sides, in others nearly all white." He further is of the opinion that Edwards confused the moths resulting from the two species of larva and that the description given by Edwards of the adult ♂ *vetusta* should apply to *gulosa* and vice-versa; to avoid confusion he limits the application of

*Contribution from the Entomological Branch, Department of Agriculture, Ottawa.

the names to the larval forms. We thus have a lupine-feeder (*vetusta*) with whitish tufts tipped with chestnut, producing a small ♂ with indistinct maculation of primaries and an oak feeder (*gulosa*) with white tufts occasionally black-tipped, emerging into a larger ♂ with distinct maculation. A similar arrangement was followed by Neumoegen & Dyar in their Preliminary Revision of N. Am. Bombyces (1894, Jour. N. Y. Ent. Soc. II, 28, 29;) later, however, in the List of N. Am. Lepidoptera (1902) Dr. Dyar treats *gulosa* as a variety of *vetusta*; the reason for this change is unknown to me but the arrangement was followed in the Barnes & McDunnough Check List (1917) for lack for any further data on the subject.

As neither the larva of *vetusta* nor of *gulosa* has been bred by me it is impossible to comment on the accuracy of the above statements; on the face of it, taking into consideration the larval distinctions and the difference in food-plants, I should incline to the belief that we are dealing with two distinct species; as to whether Hy. Edwards or Dr. Dyar is correct in the description of the resulting imagines remains for our California collectors to prove by careful breeding.

To return to our douglas fir-feeder I would point out that it cannot be referred to *gulosa* as the larva contradicts the description. In all the specimens reared (both ♂ and ♀) the dorsal tufts on abdominal segments I-IV were whitish, broadly tipped with chestnut-brown whilst the dorsal hair-pencil of segment VIII was black with a chestnut-brown tuft of half its length at the base anteriorly. The larva would thus correspond very closely with that of *vetusta*, according to the description, except that the hair-pencil of segment VIII could hardly be called "yellow tufted with black."

These discrepancies in the coloration of the larva and the fact that it is a coniferous feeder lead me to the belief that the species is undescribed; a parallel case is found in the closely allied genus *Olene* Hbn. where the pine-feeders are now recognized as distinct species from those feeding on deciduous trees.

Hemerocampa pseudotsugata, sp. nov.

Ovum.—Laid in large clusters on the ♀ cocoon or adjacent areas, covered with a gelatinous substance to which are attached numerous dark, smoky hairs from ♀ abdomen; color white; hemispherical.

Larva, Stage I.—Resembles considerably a small *Porthetria dispar* in shape. Head large, brown, with sparse hairs; palpi and clypeus whitish. Body dirty gray, tinged with reddish laterally, tubercles represented by large chitinous patches (verrucæ) containing long, slightly barbed hairs; the dorsal hairs are generally blackisk, the lateral ones white. The usual Liparid wart laterally on the prothorax is very prominent with numerous long, black, hairs. Prothoracic plate large, rectangular, with two knob-like warts on the anterior edge, each bearing about 10-12 hairs arranged in a circle; several white hairs from the anterior margins of the segment overhang the head; posterior and ventrad to the plate are two minute setæ closely approximated. Meso- and meta-thoracic segments with tubercles I and II narrowly separated; I small, obliquely oval with three short setæ, II larger, roughly circular with about two hairs; in the lateral region are two further tubercles, very similar in size and equidistant.

On abdominal segments I-IV, VII and VIII verrucae I and II form together a large rectangle, I, narrowly separated from II, being triangular and forming the anterior dorsal corner of this rectangle; on segment II it bears five hairs, on

III three hairs and on the other segments two hairs; on abdominal segments V and VI it is reduced to a mere point with a single short, white, clubbed hair, noticeably distinct from the other setae.

Verruca II bears about ten hairs normally but on V and VI it is smaller with fewer hairs and in consequence more of the pale color of the integument is apparent; on these same segments it also bears 2-3 clubbed white hairs in close proximity to that of verruca I. Laterally a large, oblong verruca (tubercles III and IV) is present with the brown spiracle situated on its ventral edge; it bears numerous hairs, including a single long black one. Below it is a further smaller verruca clothed with short whitish hair and with one long white seta. Above the prolegs a small verruca with several short white hairs. Rear segment with four, large, equally spaced verrucæ containing several long, backward-directed setæ. Prolegs with two anterior and two posterior crotchets. Length on emergence 2 mm.

Stage II.—Head as before; body light gray with slight purple-brown dorsal sprinkling behind verrucæ and heavy lateral sprinkling of same color; faint yellow shading on meso- and meta-thorax especially intersegmentally and also laterally along all segments below spiracle. Verrucæ much as before but paler; from the large prothoracic wart arises a small tuft of short plumes as well as the bristles; verruca I on abdominal segments I and II with similar black plumed hairs and merely one or two bristles; verruca I and also II on segment VIII with a few black plumes on inner edge; otherwise the bristles from verrucæ are long and mostly black; abdominal segment V with yellow dorsal shading and VI and VII dorsally with large circular yellow-orange eversible glands.

Stage III.—Head pale brownish. Body with grayish-white ground colour; dorsally the segments are shaded with dark brown forming a narrow dorsal line on thoracic segments and broadening out on abdominal to a band of dark color strongly broken with the pale ground colour and extending laterally to the lower edge of verruca II. Posterior portion of thoracic segments shaded with yellow-orange and the whole dorsum of abdominal segment V anterior to tubercles rather bright orange; glands on VI and VII bright coral-red. A broad broken band of dark brown laterally crossing verruca III, the verruca itself being encircled with pale ground color and with a patch of the same color behind it so that the edges alone of the dark band appear more or less continuous; a somewhat broken pale yellow subspiracular line below which the brown shading is predominant again. Verrucæ rather pale except I and II on abdominal segments I-IV which are dark (blackish) and form a a marked contrast to others which are slightly yellow tinged; short black pencils of feathered hair laterally from the large prothoracic wart; dorsal black hair pencils on abdominal segments I, II and VIII with very slight tufts of white plumed hairs on III and IV arising from verruca I. Of the barbed hairs the long ones are black, the others white, mostly all being longer than the hair pencils. Prolegs shaded basally and centrally with dark brown. Prothoracic plate tinged with yellowish. Not much increase in number of barbed hairs.

Stage IV.—Head black; clypeus and mouth parts whitish; overhung by white hairs arising from prothoracic plate. Body light gray tinged anteriorly with yellow; a dark blackish dorsal stripe on meso- and meta-thorax broadening into a more or less solid band of black on abdominal segments with segment V

bright yellow-orange dorsally. Body shaded with black in supraspiracular area and with the orange-yellow subspiracular line of previous stages well marked. Lateral black hair-pencils from prothoracic warts; dorsal black pencil from abdominal segment VIII. Well developed tufts dorsally on abdominal segments I-IV, the anterior two light brown, often shading into deeper brown apically and frequently edged laterally with white plumed hairs; the two posterior tufts smaller, generally composed of white plumed hairs; tuft 3, however, often considerably tinged with light brown; in such cases tufts 1 and 2 are generally smoky brown; abdominal verrucæ bright yellow-orange, edged at base by creamy line except verruca II of abdominal segments I-IV which is black. Long black hairs from verrucæ few in number; numerous shorter hairs white. Eversible glands bright coral-red. Legs yellow-orange; venter pale yellow-gray.

Amount of dark suffusion on body variable, the ♀ caterpillar being lighter in colour than ♂.

Stage V.—Head black, with white clypeus; general ground color of body grayish caused by white suffusion on black ground with thoracic dorsal portion yellow with black centro-dorsal line; dorsum between tufts broadly black; on other abdominal segments narrowly black, in ♀ tinged with brown; dorsal tufts white at base, tipped broadly with light or dark chestnut-brown; black lateral anterior pencils as before; dorsal black pencil on abdominal segment VIII preceeded by a brown recurved tuft half the length of the black pencil; a distinct subspiracular orange line; verrucæ bright coral-red, shaded with black at base, ringed by whitish.

The ♀ larvæ were noticeably larger than the ♂'s but I was unable to discover that they underwent an extra moult as is generally the case in this group.

Imago ♂.—Colour dark chocolate-brown with none of the chestnut-brown shades of allied species except traces around the reniform. Considerable sprinkling of white scales rather evenly distributed over the whole wing, more especially noticeable in the apical and median areas. Usual lines well-defined and not perceptibly different in course from those of allied species; reniform more or less white-filled. Beyond the t. p. line on costa a prominent rectangular dark patch, surrounded by whitish scaling, giving rise to the irregular dark s. t. line which is more or less defined by white scaling and terminates in a small white patch above anal angle. In normally marked specimens this s. t. line is connected with the dark marginal line by a distinct dark dash through the interspace of veins 6 and 7. Secondaries dark chestnut-brown with a broad, darker brown marginal border of varying intensity. Expanse 27-30 mm.

♀. Wing-stumps and anterior half of abdomen smoky-gray, the posterior abdominal segments tufted with thick hairs of a blackish colour, much darker than the color found in allied species.

Holotype 1 ♂, Chase, B. C., bred at Ottawa, 1920, and in Canadian National Collection.

Allotype 1 ♀, Chase, B. C., bred at Ottawa, 1920, and in National Collection.

Paratypes 4 ♂'s, 2 ♀'s, from same locality in the National Collection and in the Barnes Collection, Decatur, Illinois.

The dark tufting in the ♀ and the dark ground colour of primaries of ♂ together with the dark subterminal dash in interspace 6 seem to be characteristic of the species.

NOTES ON COCCIDÆ VII. (HEMIPTERA).*

BY G. F. FERRIS,
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A Review of MacGillivray's "The Coccidæ."

The impression seems quite generally to have prevailed (the present writer must confess to not having been immune to it) that the ability to recognize a few of our common orchard, shade tree and green-house scale insects entitles its possessor to recognition as a Coccidologist. It is, perhaps, in part this circumstance that has been responsible for the fact that while there have been many who have written on the Coccidæ there have been relatively few who have had any very profound knowledge of the group. The systematic literature, although impressive in quantity, has never been so in quality, in fact only too rarely has it risen above the level of hopeless mediocrity, while all too often it has descended even to the point of utter puerility. The greatest task before the present-day students of the Coccidæ (and those for some time to come) is that of overcoming this handicap.

In the face of these conditions it is obvious that the character of any treatment of the group that is based wholly or in large part upon the literature alone will be more or less definitely predetermined. At the best it can be of a very considerable, even if but temporary, usefulness by bringing the scattered literature to a focus and serving as a sort of point of departure. At the worst, if to the errors inherent in the sources from which it is drawn there be added an undue number for which the compiler is responsible, the possibility of usefulness may, to a very large extent, disappear. Not only may the task of which I have spoken above not be lightened, it may even to some extent be increased. This I consider, on the whole, to be the effect of MacGillivray's recent book, "The Coccidæ."

I do not need to be reminded that many of the criticisms of this book that I shall express are matters of opinion. Consequently, I may be pardoned for pointing out that as a basis for the opinions that I shall present I have available what is possibly the second largest collection of Coccidæ in the United States, and that I have personally examined with varying degrees of thoroughness some hundreds of species in the group. On the other hand, MacGillivray very clearly indicates in the preface of his book that it is based chiefly upon the literature alone, and it is obvious from the text that his acquaintance with the insects themselves is relatively limited. Even the air of profundity imparted by the special terminology employed and the appearance of authority with which the material is presented cannot entirely conceal this fact.

I cannot in any paper of reasonable length deal in great detail with the book. An extended analysis must wait upon revisional studies of the various groups, and I am presenting here a consideration only of the more obvious errors and of the conclusions in which I differ most widely from MacGillivray. It is, for instance, no part of my intention to consider the many typographical errors and other evidences of carelessness, such for example as the constant misspelling of *Antonina* (pages 122, 123, 145, 146, 476) and *ariditatis* (pages 182 and 476).

*Continued from Canadian Entomologist 52:65. (1920.)
March, 1921

The most objectionable feature of the book is the great number of new genera that have been proposed in the subfamily Diaspidinæ, practically all of which are based upon species that in all probability the author has never seen. That many new genera are needed in this group is undeniable, yet before the wholesale naming of them is undertaken there should first be a careful review of the types of the existing genera, and the whole work should be based upon an examination of specimens. The naming of new genera upon the basis of printed descriptions alone is not likely even under the most favorable conditions to be especially helpful. When done under the conditions prevailing in the literature of this group and in such wholesale fashion as attempted by MacGillivray it is little short of disastrous. The peculiar results that can thus be obtained will be discussed in connection with this subfamily.

It is not probable that anything approaching unanimity of opinion concerning the general classification of the Coccidæ will be arrived at for many years to come. There remain too many questions, such for instance as the taxonomic value of the various types of ducts and pores, that are still to be investigated. Doubtless, too, the discovery of new forms will profoundly change some of the present conceptions. As it is, even with the specimens before one, there are many points concerning which the cautious student will hesitate to express an opinion. Yet there are some things that are fairly clear and concerning which an opinion may be hazarded.

My own personal preference would be to regard the Coccidæ as a superfamily in the belief that a more expressive classification can thereby be obtained. However, this is a minor point. What is really desirable is to obtain a division into groups that will approximate a natural arrangement and that are somewhere near equal rank. This I consider that MacGillivray's proposed seventeen subfamilies do not do. I am unable to see that his arrangement is any special improvement over the classifications that have preceded it.

It is my contention that MacGillivray's six subfamilies, Monophlebinæ, Kuwaniinæ, Xylococcinæ, Margarodinæ, Callapappinæ and Ortheziinæ taken together constitute a group that is equivalent in rank to, for instance, the subfamily Diaspidinæ. In working over the Coccidæ I have been impressed with the feeling that the group is at once extraordinarily conservative and extraordinarily plastic, and in no place is this paradoxical condition shown to better advantage than in the six groups mentioned above. There is throughout this group of species a persistent adherence to a certain fairly definite general type, coupled at the same time with aberrations of the most remarkable characters. It is the adherence to this general type and not the aberrations to which I am inclined to accord the most weight.

This group as a whole is characterized by the presence of abdominal spiracles. It is true that in many of the species they have not been recorded, yet there is good reason to believe that this is due simply to deficient observation. In but two genera, *Nipponorthezia* and *Newsteadia*, each with a single species, do they appear positively to be lacking.

MacGillivray in his key to the subfamilies (pp. 58, 59) separates the Ortheziinæ from the other groups named above on the basis of the presence of an anal ring and anal ring setæ. As a matter of fact the anal ring is sometimes developed in the Monophlebinæ, being well developed but simple in

Llaveia bouvari (Sign.) and even more strongly developed with a distinct tendency toward a cellular condition in *Greenella dalbergiæ* (Green), although it bears no setæ. MacGillivray further states (p. 106) that the "pilacerores" are peculiar to the Ortheziinæ. Yet they constitute one of the points allying this group with the Monophlebinæ for exactly the same structures are present in, for instance, *Aspidoproctus maximus* Newst. and an apparently undescribed species of *Walkeriana* as well as in other species. Furthermore, the presence of compound eyes in the male of *Orthezia* is additional evidence to the same end.

The Kuwaniinæ, Callapappinæ, Margarodinæ and Xylococcinæ are separated from the Monophlebinæ by the absence of mouthparts in the adult female. Yet in five of the six genera included by MacGillivray in the first named group the mouthparts are present in the adult female, a fact that one drawing conclusions from the literature alone would not be aware of because of deficiencies in the published descriptions. I have elsewhere pointed out that in *Xylococcus macrocarpæ* Coleman the mouthparts are at times developed in the adult female.

The extraordinary development of the anterior legs in the genus *Margarodes* is apparently an adaptive character. Certainly it is hardly sufficient to justify the recognition of this genus as constituting a group equivalent in rank to the Diaspinæ. I have seen no examples of the Callapappinæ, but judging from the descriptions they too are of a Monophleboid type.

It is, of course, obvious that the group formed by the union of these six so-called subfamilies is capable of being subdivided, but this will need to be done on lines somewhat different from those that have previously been employed and on the basis of an examination of material.

In the description of the Monophlebinæ (p. 62) it is stated that the adult female never possesses an anal tube with "anacerores." Such a tube is well developed in *Gueriniella*, which MacGillivray includes in this group. He also includes under this subfamily the remarkable genus *Stictococcus*. I am unable to see in this anything of a Monophleboid character, and would rather adopt Lindinger's view, that it constitutes a separate subfamily.

Under the subfamily Kuwaniinæ the new genus *Americoccus* is proposed for *Matsucoccus fasciculensis* Herbert. I have at hand specimens of this and of *M. matsumuræ* (Kuwana), and cannot concur in the erection of this genus.

Concerning the restoration of the name *Coccus* to the genus which in the Fernald Catalogue is called *Dactylopius*, I cannot comment as the literature upon which a decision depends is not available. I may remark, however, that as Mrs. Fernald's work gives every evidence of having been carefully done, I should be inclined to accept her conclusions, at least until a careful review and restatement of the case has been made. With MacGillivray's assignment of this genus to a position between the Ortheziinæ and the other Monophleboid forms I cannot agree. While it may very well constitute a group by itself it possesses tubular ducts of the type that occur in *Eriococcus* and related forms and that I have not seen in any of the Monophleboid forms that I have examined. The association of *Epicoccus* with this genus is dubious.

I have never been privileged to examine specimens of the female of *Phenacoleachia* but I have at hand males sent me by Professor Cockerell as belonging

to *P. zealandica*. On the basis of these males and of the meager description given by Maskell I should regard this genus as a Pseudococcine form of the general type of *Puto*. The males of these two genera are practically identical. I see no reason for retaining the subfamily Phenacoleachiinæ.

The subfamily Eriococcinæ as understood by MacGillivray is certainly an unnatural group, and as he has indicated (p. 126) includes at least two groups of genera. MacGillivray's remarks (pp. 122-3) indicate that he is not aware that the dorsal ostioles or "labiæ" do not occur in *Eriococcus* and the genera related to it. They are in fact confined to the genera of which *Pseudococcus* may be taken as the type, and I regard their possession as of sufficient importance to justify a distinction between these two groups. On the other hand, MacGillivray has excluded from the Eriococcinæ the genus *Kermes*, which I regard as strictly Eriococcine. I shall consider this point under the discussion of the subfamily Kermesinæ.

The subfamily or group associated with *Eriococcus* includes the following genera of the position of which I feel sufficiently sure to hazard an opinion: *Atriplicia*, *Cryptococcus*, *Eriococcus*, *Fonscolombia*, *Gymnococcus*, *Gossyparia*, *Kermes*, *Micrococcus*, *Olliffiella*, *Rhizococcus* and *Xerococcus*. The group associated with *Pseudococcus* contains the following: *Antonina* (=*Chaetococcus*), *Cryptoripersia*, *Erium*, *Geococcus*, *Helicoccus*, *Heterococcus*, *Lachnodius* (at least in part), *Macrocepicoccus*, *Naiacoccus*, *Natalensia*, *Nesococcus*, *Phenacoccus*, *Porococcus*, *Pseudococcus*, *Puto* (=*Ceroputo*=*Macrocerococcus*), *Ripersia*, *Ripersiella*, *Rhizoecus*, *Sphaerococcus*, *Trionymus and Tylococcus*.

Ehrhornia, *Paludicoccus* and *Kuwanina* are of doubtful affinities, but I feel sure do not belong in either of the above groups. *Cissococcus*, as I have pointed out in an earlier number of these notes is a Lecaniine form. The species described by Ehrhorn as *Cissocossus* (?) *oahuensis* has since been referred by Ehrhorn to a new genus, *Phyllococcus*, which has been overlooked by MacGillivray. I have at hand specimens of this species but prefer not to express any opinion as to its relationships.

The other genera included by MacGillivray in his Eriococcinæ I have not seen specimens of, nor in some cases the descriptions, and I refrain from commenting upon them.

I may note a misstatement on page 142. It is there said that "Ferris believes that the American *Phenacoccus stachyos* Ehrh. is congeneric" with *Coccura comari* (Sulc). It is *Heliococcus bohemicus* Sulc with which I have compared *P. stachyos*.

In regard to the Tachardiinæ I may simply note that the statement that the body is not provided with pores, "cerores," or with tubular ducts, "ceratubæ," except on the stigmatic and anal processes is entirely erroneous as an examination of carefully stained specimens will quickly show. MacGillivray has adopted Cockerell's groups and although these will stand they will not do so on the basis of the characters used.

The keys and discussion of the Lecaniinæ are based entirely upon the literature and no new genera are named. I may note only that the anomalous genus *Aclerda*, which probably does not belong in this group is included without special comment, and that it is stated (p. 175) that in this genus the anal cleft and opercula are wanting. The anal cleft is present and bears at its anterior

end a single undivided plate. Also no mention is made of the fact that in *Physokermes* the opercula are wanting in the adult female, in fact (p. 175) it is said that the adult female has the "opercula prominent, swollen, dorsal in position." The structures referred to are not the opercula, which are lacking in this stage.

Concerning the Asterolecaniinæ I shall note only that to it is referred the genus *Olliffiella*. I reaffirm the opinion which I have formerly expressed, that this species is closely related to *Kermes* and should accompany the latter wherever it may be placed.

The subfamily Kermesinæ is based upon the single genus *Kermes*. As I have previously indicated I regard this genus as strictly Eriococcine, and see no reason for the subfamily Kermesinæ. I may note that MacGillivray's statement (p. 191) that the anal ring is wanting in the adult female is erroneous. In *K. cockerelli*, *kingii*, *nigropunctatus* and *vermilio*, at least, the anal ring is well developed in the adult female, although it bears no setæ.

(To be continued.)

A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE GENERA MELANOCHELIA RONDANI AND LIMNOPHORA R.-D. (DIPTERA, ANTHOMYIIDÆ.)

BY J. R. MALLOCH,
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This group is the *Limnophora* of authors, the name *Limnophora* being applicable to the species which have the prosternum and base of third vein setulose; the other segregate requires a change of name and apparently Rondani's name must be used.

The species of *Melanochelia* occur most commonly in the north and usually along the margins of lakes or streams. *Limnophora* occurs more commonly in the south, many species being found in the tropics throughout the world, and even very frequently on small islands far removed from the large land masses. The larvæ are, so far as I know, aquatic.

Melanochelia Rondani.

KEY TO SPECIES.

1. Thorax with four pairs of postsutural dorsocentral bristles; halteres yellow (cf. *obsoleta*) ..... 2.
— Thorax with four pairs of postsutural dorsocentral bristles; halteres black or brown ..... 13.
— Thorax with three pairs of postsutural dorsocentral bristles ..... 19.
2. Orbital hairs descending much below level of base of antennæ; facial ridges haired about midway to base of antennæ; basal abdominal sternite haired ..... *Lispoides æqualis* (Stein).
— Orbital hairs not descending below base of antennæ ..... 3.
3. Basal abdominal sternite with some setulose hairs; fourth wingvein usually slightly curved forward at apex ..... *Eulimnophora* Malloch.
— Basal abdominal sternite bare ..... 4.
4. Eyes of male separated by much less than distance across posterior ocelli; sternopleurals 1:1; anterior acrostichals in two series; hind tibia with one anterodorsal and one anteroventral bristle ..... *torreyæ* Johannsen.

— Eyes of male separated by as great a distance as width across posterior ocelli; characters not in all respects as above.....5.
5. Males.....6.
— Females.....11.
6. Calyptræ dark brown; eyes separated by one-third of the head-width; frons velvety black; hind femur with bristles on entire length of postero-ventral surface.....*velutina* Malloch.
— Calyptræ whitish or yellowish; species not as above in other respects.....7.
7. Small species, not over 4 mm. in length, densely white pruinescent; presutural acrostichals strong, two-rowed; females of known species without paired spots on abdomen, and the genitalia with two or four short thorns at apex.....8.
— Larger species, over 5 mm. in length, brownish gray pruinescent; presutural acrostichals in at least three series; females without thorns on genitalia.....9.
8. Fourth abdominal tergite distinctly longer than third; cheek but little higher than width of parafacial at base of antenna; abdomen silvery, third tergite without paired spots.....*argentiventris* Malloch.
— Fourth abdominal tergite not longer than third; cheek twice as high as width of parafacial at base of antenna; abdomen whitish gray, not silvery, third tergite with a pair of small spots.....*brevicornis* Malloch.
9. Hind femora with long bristles on antero- and posteroventral surfaces, those on the latter finer than on the former, and not extending to base.....*novæ-anglæ* Malloch.
— Hind femora with at most very short bristles on posteroventral surface, those on anteroventral long and strong, but confined to apical half....10.
10. Hind femur with a number of short, erect bristles on median portion of posteroventral surface; eyes separated by less than width across posterior ocelli; each orbit as wide as interfrontalia....*gibsoni* Malloch.
— Hind femur without median posteroventral bristles; eyes separated by width across posterior ocelli; each orbit about half as wide as interfrontalia.....*monticola* Malloch.
11. Lower calyptra hardly protruding beyond upper; costal setulæ longer than diameter of costal vein.....*obsoleta* Malloch.
— Lower calyptra projecting much beyond upper; costal setulæ not as long as diameter of costal vein.....12.
12. Small species, not over 4 mm. in length; thorax and abdomen with grayish white pruinescence, without dorsal spots; genitalia of female with some strong apical thorns.....*brevicornis* Malloch.
— Larger species, averaging over 5 mm. in length; thorax and abdomen with brownish pruinescence, the former vittate, the latter with paired dorsal spots.....*nobilis* Stein.
13. Presutural acrostichals consisting of two very closely placed, rather irregular series of short setulæ; abdomen with a linear dorsocentral black vitta and black paired dorsal spots; basal segment of hind tarsus a little less than half as long as hind tibia; basal separation of antennæ linear.....*tetrachæta* Malloch.
— Presutural acrostichals consisting of four or more series of fine hairs;

abdomen with paired dorsal spots which are sometimes fused or without distinct spots, and never with a dorsocentral vitta.....14.

14. Calyptræ exceptionally small, the lower one not twice as large as the upper; abdomen with the dorsal spots so greatly enlarged as to cover the entire dorsum except the extreme posterior margin of each tergite; costal hairs setulose, very distinctly longer than diameter of costal vein; vibrissal angle not noticeably produced beyond line of base of antennæ.....*obsoleta* Malloch.

— Calyptræ large, the lower one twice as large as the upper; abdomen with distinct paired dorsal spots; costal setulæ minute; if the abdomen is indistinctly spotted the vibrissal angle is produced much beyond a vertical line drawn from base of antennæ.....15.

15. Vibrissal angle but little produced, almost in vertical line with base of antennæ.....16.

— Vibrissal angle very conspicuously produced beyond vertical line from base of antennæ.....17.

16. Small species, not 4 mm. in length; abdomen unspotted, the entire body with whitish pruinescence; genitalia with 4 short thorns.....*brevicornis* Malloch.

— Larger species at least 5 mm. in length; abdomen with large black paired spots, the entire body with brownish pruinescence.....*nobilis* Stein.

17. Hind femur with 4 or 5 moderately stout, long bristles on apical two-fifths of anteroventral surface; last section of fourth vein three times as long as preceding section; veins 2 and 4 up to outer cross-vein and both cross-veins tinged with brown along their courses.....*pearyi* Malloch.

— Hind femur with long, hair-like bristles from base to apex on anteroventral surface; last section of fourth vein less than twice as long as preceding section; veins not tinged with brown.....18.

18. Large species, at least 6 mm. in length; female orbits with rather dense bristly hairs laterad of the bristles, the hairs almost as long as the bristles; wings of male rather pointed at apices.....*angulata* Malloch.

— Smaller species, not over 4.75 mm. in length; female with short sparse hairs laterad of the bristles on orbits; wings of male rounded at apices.....*extensa* Malloch.

19. Calyptræ dark brown; wings distinctly infuscated; eyes of male separated by much less than width across posterior ocelli.....*anthrax* Bigot.

— Calyptræ whitish; halteres yellow; wings usually clear.....20.

20. Eyes separated by almost one-third of the head-width; hind femur without posteroventral bristles; the paired dorsal abdominal spots with a connecting brown patch between them.....*caroli* Malloch.

— Eyes separated by much less than one-third of the head-width; abdominal dorsal spots not as above.....21.

21. Hind tibia with one or more setulæ at or near middle on posterodorsal surface.....22.

— Hind tibia without setulæ on posterodorsal surface.....27.

22. Tibiæ pale, reddish; wings clear, veins pale; abdomen narrow, cylindrical, the dorsal spots of moderate size, widely separated; fore tibia with a median posterior bristle.....*suspecta* Malloch.

— Tibiæ black; wings usually infuscated, more distinctly so basally, veins black; abdomen ovate except in *alticola*, the dorsal spots large, separated by a linear space; fore tibia without a median posterior bristle except in *alticola*.....23.

23. Eyes separated by more than twice the width across posterior ocelli; hind femur with long bristly hairs on basal half of posteroventral surface.....24.

— Eyes separated by less than twice the width across posterior ocelli.....25.

24. Fifth abdominal sternite with a chitinous protuberance near apex on each side of posterior excavation; mid femur without strong bristles at base on posteroventral surface.....*acuticornis* Malloch.

— Fifth abdominal sternite without such protuberance; mid femur with strong bristles on basal half of posteroventral surface.....*surda* Zetterstedt?.

25. Abdomen cylindrical, slightly tapered apically; hind femur with long bristly hairs on basal half of posteroventral surface; eyes separated by more than width across posterior ocelli.....*alticola* Malloch.

— Abdomen ovate; hind femur without long bristly hairs on posteroventral surface; eyes separated by less than width across posterior ocelli.....26.

26. Fifth abdominal sternite with sparse setulose hairs laterad and distad of base of posterior excision; abdominal dorsal spots separated by a linear space.....*magnipunctata* Malloch.

— Fifth abdominal sternite with very dense short setulæ laterad and distad of base of posterior excavation; the dorsal abdominal spots on third and fourth tergites rather widely separated, much more so than those on second.....*imitatrix* Malloch.

27. Thorax when viewed from behind with the anterior half of disc brownish black, the posterior half densely gray pruinescent; abdominal dorsal spots narrow, elongate, sometimes linear; mid tibia without an anterodorsal bristle; hind femur unarmed on posteroventral surface.....*clivicola* Malloch.

— Thorax deep black when viewed from behind, only the posterior margin grayish pruinescent; abdominal dorsal spots large and broad; mid tibia with one or more anterodorsal bristles; hind femur with some short, stout bristles on median third of posteroventral surface.....*gibsoni* Malloch.

Limnophora Robineau-Desvoidy.

Key to Species.

1. Fifth abdominal sternite in male much longer than fourth; male hind femur incrassated at base and apex.....*incrassata* Malloch.

— Fifth abdominal sternite in male not longer than fourth; femora normal..2.

2. Eyes of male narrowly separated, the frons not wider than third antennal segment; first posterior cell of wing much narrowed apically.....*narona* Walker.

— Eyes of male separated by more than width of third antennal segment; first posterior cell of wing almost imperceptibly narrowed apically....3.

3. Female with an anterodorsal bristle on mid tibia.....*groenlandica* Malloch.

— Female without an anterodorsal bristle on mid tibia.....*discreta* Stein.

FURTHER NOTES ON EVENING FLOWERS, PANURGINE AND HALICTINE BEES.

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The present paper is supplementary to two previously published on these forms (Can. Ent. 51:205–210, Ent. News 31:35–44). Through the kind co-operation of my friend Dr. J. F. Brenckle I was able to make a fourth visit to the sand hills near Sheldon, North Dakota, and succeeded in obtaining the females of *Hesperapis carinata* and *Perdita tridentata*.*

Notes on nesting of *Agapostemon splendens* were also secured and these with data on the other species and of *Augochlora* in North Dakota are presented. I am inclined to regard these two groups as subgenera of *Halictus* as has been done by Ducke and Viereck.

No further data of interest on other panurgine bees in North Dakota has been obtained, but the absence of *Greeleyella* at Rugby might be noted. It was looked for there on June 30th to July 4th, but is doubtless an austral species which does not extend quite that far (see Am. Journ. Bot. 7:231–242 for notes on distribution of plants in the state).

Hesperapis carinata Stevens.

1919. *Hesperapis carinata* Stevens, Can. Ent. 51:209, male.

Female.—Length about 12 mm. Very similar to male but stouter, hair bands of abdomen prominent and cream coloured. Face sub-quadrate, sparsely hairy on occiput, sides, around antennæ bases, sides and anterior edge of clypeus; clypeus bare or nearly so on median part, shining, rather finely but not very closely punctured; vertex smooth and shining, antennæ reddish beneath, browner above, mandibles toothed.

Mesoscutum inclined to be bare medially with a few, short, dark hairs. A well developed scopa of rather stiff, short-branched hairs on posterior tibia and basitarsus (femur and trochanter with only a few short hairs) that of the basitarsus distinctly parted on posterior edge (Fig. 1-b). Sixth dorsal segment narrowed, truncate, somewhat concave with a low raised triangle on basal middle (Fig. 1-c); laterally this segment is pubescent as in the male, the dorsal concave surface slightly striate. Wing nervures a variable pale brown, darker than in the male.

Nine specimens at flowers of *Helianthus petiolaris* in the sand hills near Sheldon, North Dakota, Aug. 21, 1920. Allotype No. 12688. When first attempting in 1916 to determine this bee, I was much puzzled as to its generic position, unless it belonged in *Hesperapis* of which I had neither descriptions nor specimens. Prof. Cockerell reported it as a new species of *Halictoides*. Mr. J. C. Crawford, however, when specimens were sent to the U. S. National Museum, wrote that it was a *Hesperapis* and called attention to the Y-shaped carina as distinctive. The general appearance of both sexes is much that of a *Colletes*. The stigma is poorly developed and is pale medially. The scopa is not similar to our other panurgines and the cleft in that of the basitarsus is unique as far as I know.

*Types and allotypes of these are in U. S. Nat. Mus.; a paratype and metatype of *Hesperapis*, metatypes of *Hesperapis*, *Perdita* and *Halictus oenotheræ* in Acad. Nat. Sci. of Phila.

The type of *Hesperapis* (*H. larræ* Ckll.) was described as parasitic, but Prof. Cockerell writes that such idea was erroneous. None of the *carinata* females were carrying a full load of pollen, although two seem to have a small amount which had been moistened. I believe it is a regular *Helianthus* bee and that it was yet early for them to be collecting. The day was not very favorable although some species of *Perdita* and *Andrena* were busily collecting on the sunflowers. None of the females had been found on a warm, windy afternoon two days before (two males on each day). This, the fourth visit to the place, was made later this year, bearing in mind the general rule of protandry and the extreme case of the closely related *Rhophites* as cited by Friese (Zool. Jahr., 1890). Several males were taken Aug. 10, 1919, inactive on the sunflowers' heads all day.

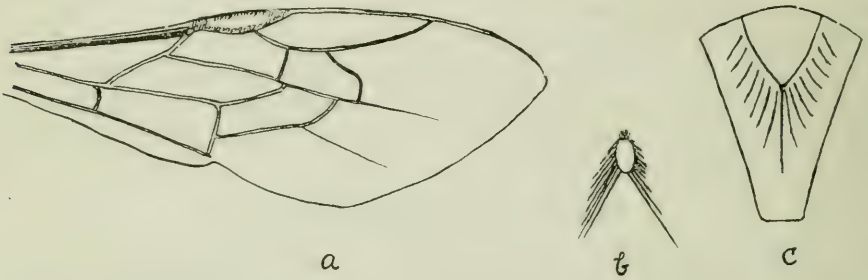

Fig. 1. *Hesperapis carinata*, female; a, forewing; b, hind basitarsus in cross-section; c, sixth dorsal segment of abdomen.

Perdita tridentata Stevens.

1919. *Perdita tridentata* Stevens, Can. Ent. 51:206, male.

Female.—Length about 6 mm. Similar to the male; head and thorax bronzed greenish blue, clypeus, legs and abdomen dark brown. Face without yellow markings, mandibles reddish, antennæ yellowish beneath, brownish above; abdomen with transverse yellow spots on second and third segments, the first usually with smaller ones; fore tibiæ with a yellow stripe.

Sixteen specimens at *Helianthus petiolaris* in the sand hills near Sheldon, N. D., Aug. 28, 1920. Allotype No. 12662. The spots on first segment are sometimes absent or nearly so, sometimes proportionately as large as the others, which are separated by a space about equal to their length. The females were collecting pollen. It took also 5 males, and on Aug. 10, 1919, at same place on the same flowers, 2 males.

This seems to be close to *sexmaculata* Ckll. (1895) and its var. *punctata* Ckll. (1896), but I judge probably distinct. It has no spots on segment 4, mandibles not yellow, stigma hyaline medially, cubital and discoidal nervures not especially produced, tarsi all dark. Mr. E. T. Cresson Jr., has compared specimens with the type of *sexmaculata* and reports: "*tridentata* has more granulose bronze vestiture; the other being polished with scarcely any bronze. *Sexmaculata* abdominal spots are round or slightly transverse, and are also present on segs. 4–5. Its fore tibiæ are yellow in front and black behind."

Agapostemon viridulus (Fab.)

Fargo, Nicholson, Monango, Glen Ullin, Mott, Marmarth, Dickinson

and Minot; 26 females, June 25, July 1, 3, 4, 7, 14, 16, 18, 25 and 27 at flowers of *Brauneria pallida*, *Carduus undulatus*, *Lactuca pulchella*, *Onagra strigosa*, *Opuntia humifusa*, *Petalostemon purpurea*, *Rosa*, *Sisymbrium altissimum* and *Taraxacum taraxacum;* 5 males, Sept. 15, 20, and 25 at flowers of *Aster chinensis*, *A. paniculatus* and *Helianthus maximiliani*.

Agapostemon radiatus (Say).

Fargo and Mandan; 14 females, May 14, 26, June 17, 26, Aug. 7, Sept. 8 at flowers of *Dracocephalum parviflorum*, *Erigeron philadelphicus*, *Oxalis stricta*, *Physalis ixiocarpa*, *Ribes missouriensis*, *Rosa*, *Salix*, *Symphoricarpos occidentalis* and *Taraxacum taraxacum;* 21 males, Aug. 7, 11, 13, 25, Sept. 6, 8, 11, 15, 18, 27 and Oct. 15, at flowers of *Aster paniculatus*, *A. sagittifolius*, *Bidens frondosa*, *B. vulgata*, *Grindelia squarrosa*, *Medicago sativa*, *Melilotus alba*, *Physalis ixiocarpa* and *Physostegia parviflora*.

Also females from Minneapolis, Minnesota, at *Aquilegia* (Nevada S. Evans), Webster City, Iowa, on *Syringa vulgaris* (J. R. Campbell), and Blue Rapids, Kansas, *Oxalis stricta* (Edna M. Stevens); a male from Blue Rapids at *Helianthus tuberosus*.

Agapostemon texanus (Cress.).

Fargo, Venlo, Lisbon, Nicholson, Monango, Oakes, Kulm, Gascoyne, Bowman, Valley City, Jamestown, Mandan, Glen Ullin, Mott, Dickinson, Washburn, Pleasant Lake, Minot, Williston, and Schafer; 92 females, Apr. 29 May 5, 11, 13, 17, June 2, 4, 5, 14, 16, 26, 28, July 1, 3, 4, 7, 10, 11, 18, 21, 25, 26, 27, Aug. 9, 12, 13, 17, Sept. 5, 10, 17, Oct. 22 and 31; at flowers of *Aster chinensis*, *Brassica arvensis*, *Brauneria pallida*, *Cactus viviparus*, *Carduus undulatus*, *Centaurea jacea*, *Cerastium arvense*, *Chrysopsis villosa*, *Dracocephalum parviflorum*, *Erysimum asperum*, *Gaillardia aristata*, *Gaura coccinea*, *Grindelia squarrosa*, *Helianthus annuus* (cult.), *H. petiolaris*, *Homalobus tenellus*, *Lactuca pulchella*, *Malvastrum coccineum*, *Medicago falcata*, *M. sativa*, *Onagra strigosa*, *Opuntia humifusa*, *Pentstemon albidus*, *P. gracilis*, *Prunus americana*, *Ratibida columnaris*, *Ribes setosum*, *Rosa*, *Rudbeckia laciniata*, *Senecio perplexus*, *Spiræa salicifolia*, *Symphoricarpos occidentalis*, *Taraxacum taraxacum*, and *Trifolium repens;* 37 males Aug. 7, 11, 13, 14, 17, 18, 24, 25, 30, 31, Sept. 5, 6, 8, 10, 13, 15, 17, 19, 20, 21, 27, Oct. 1, 14, 22, 27 at flowers of *Allionia hirsuta*, *Aster chinensis*, *A. laevis*, *A. multiflorus*, *A. paniculatus*, *Boltonia asterioides*, *Centaurea jacea*, *Erucastrum pollichii*, *Grindelia squarrosa*, *Gutierrezia sarothræ*, *Helianthus maximiliani*, *Physalis ixiocarpa*, *Physostegia parviflora* and *Sideranthus spinulosus*.

This is by far the most common species of the group in North Dakota and one of the most common bees. The earliest Fargo record which I have is Apr. 29, 1913, (C. H. Waldron). The October records are all in 1915, but the past year a male was seen Oct. 20, and both sexes quite abundant in the early part of the month, the fall having been mild except for one heavy frost on Sept. 29.

A single female from Ft. Douglas, Utah, (J. F. Brenckle, May 5, 1918, at *Balsamorrhiza sagittata*) differs somewhat in the sculpture of the propodeum. It has a fairly distinct enclosure, from which run laterally about a dozen prominent ridges, converging slightly on the angle.

I have also 6 females from Denver, Colo., 3 at *Cleome serrulata* and 1 at *Sisymbrium altissimum* (Edna M. Stevens, July 5, 1915). Two of these and

one or two of the North Dakota specimens show rather straight, coarse ridges on the propodeum, on the rest it is more reticulate with fine ridges, an enclosure often suggested but not well developed.

Agapostemon splendens (Lep.).

Fargo, 3 females Oct. 15, 21 and 27, 1915, at *Grindelia squarrosa* and *Taraxacum taraxacum;* Sheldon, Aug. 28 and 30, 1920; 5 females; 5 males at Sheldon, Aug. 10, 1918, and one at Sentinel Butte Aug. 30, 1914. The male from Sentinel Butte and one of those from Sheldon have the first abdominal segment entirely black at base instead of yellowish medially.

In the sand hills near Sheldon this bee was found nesting on the sides of a "blow out" where the sand was fairly stable and sparsely covered with grass tufts. A female was seen at a hole so I decided to attempt an excavation of a similar opening. The one selected showed particles of pollen near the opening. The shaft proved to be about 8 mm. in diameter and vertical for about 1 m. Here it was lost but a lateral was found which extended irregularly somewhat backward and downward for about 3 dm. Two other similar branches, supposedly of the same shaft were found, the second about 6 cm. below the first. An enlargement of the end of the branch formed the single cell which was smooth within but fell to pieces at a touch. A ball of pollen found in No. 2 was nearly spherical, 8 mm. in diameter. The first contained pollen but was disturbed in digging, the second apparently spoiled pollen.

Three other nests were opened and in each the female was found working on the vertical shaft, two at a depth of 1 m., and one at 1.5 m. Many other similar openings were seen, perhaps one or two per meter in suitable parts of the bank. Some were open, some closed, usually surrounded by a very small handful of sand.

Augochlora confusa (Rob.).

This is not at all common. I took at Fargo a female at *Hydrophyllum, virginicum*, another at *Zizia aurea* on June 14, 1913; one at *Grindelia squarrosa*, Aug. 17, 1911. On June 23, 1917, I found them quite abundant, collecting pollen of *Erigeron philadelphicus;* on Aug. 25, and Sept. 11 of same year common at *Aster paniculatus*, also *A. laevis*, *Solidago canadensis*, and *Vernonia fasciculata;* males at *Helianthus maximiliani*, *H. tuberosus*, and *Solidago canadensis.*

Halictus texanus (Cress.).

My sister, Edna M. Stevens, sent me females taken at Blue Rapids, Kans., May 30, 1920, the same place that I found them the year before (Ent. News 31:36). She found them abundant at the *Megapterium* flowers about 7.30 p.m., but saw only one at 8.30. On June 10, at another place about two miles distant she found them at 8.30, a single one at *Achillea millefolium.*

Halictus oenotheræ (Stevens).

Three females, May 30, 1920 (with the *texanus*), one bearing a full load of pollen as I have described for *texanus.*

Halictus aberrans (Crawford).

A small amount of data relative to time of flight (females only) and opening of *Gaura coccinea* flowers was obtained the past season at Rugby, N. D.

June 29, 6 p.m.—flowers opening, bees active.
" 29, 6 " —bees less active; sunset at 8.40.
" 30, 7–8 a.m.—a few bees.
" 30, 5 p.m.—no flowers open, several bees at old ones; old flowers removed from three plants.
" 30, 6 " —5, 5, and 6 flowers open on the 3 plants; bees active.
" 30, 7 " —9, 18, and 13 flowers open on the 3 plants.
" 30, 8 " —2, 6 and 2 flowers open on the 3 plants.
" 30, 9 " —0, 0 and 0 flowers open on the 3 plants; no bees.

This shows clearly that the main period is from one to two hours before sunset. Some plants of *Anogra pallida* were watched at same time. Three flowers opened at 9 p.m., but no visitors were seen in the next half hour. One specimen of *Autographa falcifera* Kby., apparently the moth referred to (Ent. News 31:43), was taken at *Gaura* in the evening, two of *Rhodophora florida* Gn. at *Anogra* in the morning (det. by Henry Skinner and deposited in the Acad. Nat. Sci. collection).

A NEW GENUS AND A NEW SPECIES OF SPIDERS IN THE GROUP PHRUROLITHEÆ.

BY RALPH V. CHAMBERLIN,
Cambridge, Mass.

Phruronellus, gen. nov.

Proposed for a group of species heretofore included in *Phrurolithus*. The males are characterized by having near the proximal end of the femur, or sometimes at the middle, beneath, a conspicuous but short apophysis which is usually bent at the end, in place of the simple swelling at the distal end of femur present in species of *Phrurolithus* sens. str. Also by having the tibial apophysis with two distinct prongs united at base. The cephalothorax is more nearly circular in outline, the head region less narrowed, and differing in being uniformly dark

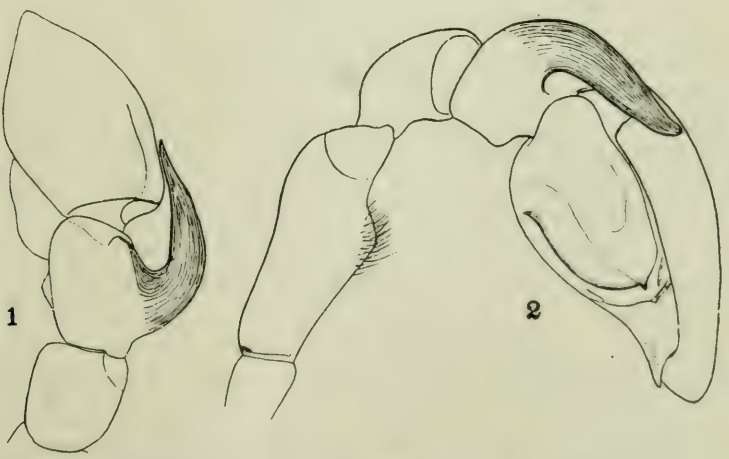

Fig. 1. *Phrurolithus parallelus*, sp. nov. (1) dorsal view, (2) sublateral view of male palpus.

shiny chestnut or blackish, without any definite markings such as are present in *Phrurolithus*. First legs without the tibiæ conspicuously black, as in the latter

genus. Femora usually darker than distal joints, especially on first two pairs of legs. Abdomen also dark above with markings obscure or absent.

Genotype.—Phrurolithus formica Banks.

Other known species in this genus are *pugnatus* (Emerton) and *similis* (Banks), the *Phrurolithus affinis* of Banks being the same species as the *pugnatus* of Emerton. The North American species remaining in *Phrurolithus* sens. str. are *alarius* (Hentz), *borealis* Emerton, *minutus* Banks, *parcus* (Hentz), probably *britcheri* Petrunkevitch, which species is unknown to me, and the new species described below.

Phrurolithus parallelus, sp. nov.

Male.—Carapace yellow, lateral margins black, sides a little dusky, with deeper branched lines as in *borealis*. Legs yellow excepting the first pair which have the femur, patella and tibia, excepting the light distal end of latter, darkened, the tibia darkest. Sternum yellow. Abdomen above dark, almost black, without markings, pale beneath with two darker lines united in front of spinnerets and extending forward to middle. Abdomen narrow with anterior corners angular and the margin between them but little convex, the sides subparallel. Femur of male palpus with a rounded swelling beneath at distal end covered with stiff hairs, this not limited on ectal side by a non-pilose, keel-like elevation such as is present in *alarius*. Tibial apophysis geniculate at base as usual, rather short, of gradually decreasing width to acute apical part, the latter not bent or twisted. (See Fig. 1.)

Length, 2.3 mm. Length of cephalothorax, 1 mm.; width .86 mm. Length of tib. +pat. IV, 1.4 mm.; of tib. +pat. I, 1.23 mm.

Locality.—Washington, Wawawai. One male.

NEW PARASITIC HYMENOPTERA OF THE SUBFAMILY ANTEONINÆ (DRYINIDÆ).

BY F. A. FENTON,
Ames, Iowa.

The *Anteoninæ*[1] comprises a small but well-differentiated group of hymenopterous insects parasitic on leaf and treehoppers (*Homoptera*). One of the striking characteristics of these insects is the fact that with the exception of one tribe, all the females have the anterior tarsal joints modified to form a chela or grasping organ. In the more specialized genera there is a marked sexual dimorphism, the females being wingless and ant-like.

During the summer of 1919 the following species were collected or reared from leafhoppers and have been carefully compared with related species and are considered new.

Epigonatopus americanus, n. sp.

Female.—This species differs greatly in colour from *solitarius* Perkins and in body sculpture from *fallax* Perkins. Length 2.5–2.75 mm. Black except tips of coxæ, trochanters, generally tibiæ and tarsi, basal three to four antennal joints, and face below base of antennæ, which are testaceous. Antennæ twice length of head. Vertex of head flat; surface of head and prothorax

1. This group has been variously given the rank of family (*Dryinidæ*) and subfamily (*Anteoninæ*) by different writers. It is also included by some in the superfamily *Proctotrupoidea* and by others in the *Vespoidea*.

polished and with minute punctures, thoracic constriction minutely tuberculate, anterior half of propodeum smooth and polished dorsally, posterior half densely and minutely punctate. Abdomen smooth and polished. Thorax with few scattered hairs, these more numerous ventrally.

Described from five specimens collected by E. D. Ball, Ames, Iowa, July 25, 1919. This species was found associated with *Balclutha impicta* Van Duzee nymphs and was probably parasitic on this insect since this was by far the most abundant species of leafhopper on an annual species of *Panicum*. Owing to the large series of specimens the writer was able to dissect for the character of the mouth parts and the maxillary palp was found to be very short and two-jointed. This fact places this species in the genus *Epigonatopus* Perkins in which there are but two species described, *solitarius* and *fallax* from Australia.

Gonatopus agropyrus, n. sp.

Female.—Comes nearest to *bicolor* Ashm. but differs especially in colour of abdomen. Length 2 mm. Testaceous, except basal three joints of antennæ and abdominal petiole which are fuscous. Abdomen varies from partly to entirely fuscous. Antennæ short, slightly longer than head. Head and prothorax smooth and polished, thoracic constriction and central elevated part of propodeum minutely punctate, anterior part of propodeum rugose, posterior part distinctly transversely aciculated. Abdomen smooth and polished.

Male.—Length 2.3 mm. Black, body covered with fine scattered hairs; antennæ as long as head and thorax together, pubescent. Maxillary palpi extending almost to posterior margin of head, with three joints visible; mandibles fuscous. Antennal joints 1 and 2 subequal, together being slightly shorter than 3; 3, 4, 5 and 6, subequal, each succeeding joint slightly shorter than preceding; 7–10 shorter, subequal. Ocelli all visible from above. Prothorax not visible from above; eyes pubescent; mesothorax shining and very finely reticulate. Parapsidal furrows distinct, converging and meeting at posterior margin of mesothorax; scutellum much shorter than mesonotum, smooth and polished; propodeum distinctly rugose. Wings hyaline, and clothed with fine hairs. Venation pale, radius curved, extending almost to margin of wing.

Described from one male and two females reared from *Deltocephalus affinis* nymphs collected by the writer at Ames, Iowa, July 19 and September 25, 1919.

A female reared from *Deltocephalus affinis* adult collected by the writer at Ames, Iowa, September 24, 1919, is apparently the same species. In coloration and body sculpture it is practically identical but it is somewhat larger, measuring 3 mm. in length.

Gonatopus similis, n. sp.

Female.—Resembles *mimoides* Perkins but differs in character of thoracic and propodeal sculpturing. Length 3 mm. Testaceous, except basal two joints of antennæ, vertex around ocelli, petiole, and posterior half of abdomen which are fuscous to black. Antennæ long, two to three times length of head. Head and prothorax smooth and polished. Thoracic constriction minutely tuberculate, propodeum finely reticulately sculptured. Abdomen smooth and polished. Thorax and abdomen with scattered hairs.

Described from a single specimen reared from *Deltocephalus affinis* nymph collected July 24, 1919, at Ames, Iowa.

ADDITIONS TO AGRILUS BIBLIOGRAPHY.

BY C. A. FROST AND H. B. WEISS,
New Brunswick, N. J.

The following references were inadvertently omitted from the bibliography published in this journal September and October, 1920.

A. subtropicus Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 131, 1905.
Collected on Momisia pallida (Schaeffer).

A. huachucæ Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 150, 1905.
On oak (Schaeffer).

A. dolli Schaeffer.

Schaeffer, Jour. N. Y. Ent. Soc., vol. XII, p. 210.
Taken from branches of Acacia flexicaulis (Schaeffer).

A. quercus Schaeffer.

Schaeffer, Sci. Bul. Mus. Brook. Inst., vol. I, p. 150, 1905.
On oak (Schaeffer).

CORRECTION OF A STATEMENT CONCERNING THE TERMINAL ABDOMINAL STRUCTURES OF MALE INSECTS.

BY G. C. CRAMPTON, PH. D.
Massachusetts Agricultural College, Amherst, Mass.

The statement that the gonopods (outer claspers, representing modified styli) of male insects probably represent the dorsal valvulæ of the ovipositor of the female (Canadian Entomologist, LII, 1920, p. 180) is somewhat misleading, and should be corrected. The gonopods of the male probably represent the *styli* borne at the tips of the dorsal valvulæ of the ovipositor of the immature females of certain roaches, phasmids, grylloblattids, etc., (or the adults of certain sawflies, Odonata, etc.), rather than the dorsal valvulæ themselves, and it is, therefore, more exact to state that the gonopods of the male correspond to the valvular styles of the female insect. The dorsal valvulæ of the ovipositor of the female insect are probably modified "coxites" (ovicoxites) corresponding to the "coxites" of the gonopods (gonocoxites) of the male insect, and the gonopods and styli doubtless represent exopodites, while the penis valves and inner valvulæ of the ovipositor probably represent endopodites of a pair of limbs whose basal segments are represented by the ovicoxites in the female (dorsal valvulæ) or the gonocoxites in the male insect.

It is possible that the penis valves of male ephemerids, sawflies, etc., (i. e., the endopodites of a modified limb) do not strictly correspond to the phallic lobes of male roaches, etc., since the latter may represent merely outgrowths of the intersegmental membrane between the ninth and tenth sternal regions. Furthermore, it is quite possible that the so-called surhami or hook-like processes of the parapodial plates of certain roaches are merely modified processes of the tenth tergite, which have become secondarily united with the parapodial plates. This, and several other points of a similar nature, will be discussed more at length in a later paper.

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Owing to the high cost of production, the Executive Council of the Entomological Society of Ontario has decided that author's separates can no longer be supplied free of charge, and, if desired, must be paid for at the current rates.

It will further be necessary to ask authors to bear the entire cost of reproduction of all illustrations used in their articles, this to include the cost of coated paper inserts where such are required.

It is realized that the above course is bound to work a certain amount of hardship on authors and reduce materially the value of many articles. Since, however, the only alternative—if the Canadian Entomologist is to continue as a publication—would be a considerable increase in the subscription price or a reduction in the size of the journal, it is felt that entomologists generally will favor the above procedure.

POPULAR AND PRACTICAL ENTOMOLOGY.

THE APPLE LEAF-CRUMPLER AS A PEST OF COTONEASTER.

BY HARRY B. WEISS,
New Brunswick, N. J.

For the past several years this widely distributed species *Mineola indiginella* Zell.[1] which normally feeds on apple, quince, plum, cherry, peach and pear and which is rarely troublesome in well-kept orchards, has been noted as attacking various species of *Cotoneaster*, notably *microphylla* and *horizontalis* in a nursery at Rutherford, N.J. The Cotoneasters are ornamental shrubs, many of them having decorative fruits which remain usually through the entire winter. Some are adapted for rockeries on account of their low spreading or prostrate habit. They belong to the *Rosaceae* along with the apple, peach, etc.

The habits of the insect on Cotoneaster are practically identical with those noted on apple. The partly grown reddish brown caterpillars hibernate in a dark colored, elongate, crooked or twisted tube which is sometimes horn-like or cornucopia shaped. These tubes, which are about an inch in length, wide at one end and tapering to a point, are fastened securely to a twig for their entire lengths and are closed at both ends. Sometimes a tube will partly encircle a twig. Many tubes will be found where the branches fork. Each is lined inside with silk and covered outside with particles of leaves, etc.

In the spring the larvæ open the large ends of their cases and web up the foliage somewhat in the vicinity of the cases, later feeding on the leaves, flower buds, etc. Many of them feed on the green bark at the mouths of the cases and sometimes girdle the twigs. This twig eating habit was noted for the first time by Saunders[2] in connection with injury to fruit trees. As the larva grows

1. Identified by Mr. Carl Heinrich.

it enlarges its case by building additions to the wide end which is always open. The larva becomes full grown about the first or second week of June, loosely closes the opening of its tube with particles of leaves and silk and transforms to a reddish-brown pupa, which stage lasts about two weeks after which the moth appears. There is only one brood annually and eggs deposited during July result in overwintering larva. Most of the larval feeding appears to take place during the night, the larvæ remaining in their tubes during the daytime.

The adult was described by Zeller in 1848 under the name *Myelois indiginella,* the habitat being given as North America. The first reference to it in American literature appeared in 1851 in the Prairie Farmer. After this date later notices appeared in the Prairie Farmer and other publications. In 1889 Forbes[3] gave an account of the species and a good review of the literature up to that time. Stedman[4] and Slingerland and Crosby[5] state that in the spring, the larvæ cut the fastenings of their winter cases and travel with the cases to the opening buds on which they feed. Saunders[6] states that when the caterpillars become active in the spring they leave the cases and draw the opening leaves near so that their meals can be enjoyed in safety. He mentions nothing about the case being carried about. On Cotoneaster the overwintering cases or tubes are securely fastened to the twigs for their entire lengths and in the spring the larva feeds on the foliage and twig bark in the immediate neighborhood of the case. Many specimens were examined but not one was observed carrying its case around. It was noted that larvæ which were removed from their cases and placed on foliage away from their homes, constructed new cases in the course of a day or so.

As only a brief description of the larva was given by Forbes[7], the following is included:—

Full grown larva. Length about 13 mm. Width about 2 mm. Brown or greenish, subcylindrical, tapering slightly posteriorly. Head and cervical shield dark reddish-brown. Head broad, almost as wide as thorax, strongly shagreened, thoracic shield somewhat less so. Ocelli lateral, six in each group, five arranged in a semicircle and one below close to the antenna. Antenna three jointed, penultimate joint dark brown, ultimate joint minute. Thoracic shield occupying the greater part of the dorsal surface of the prothorax and bisected by a pale brown median line, at the end of the shield on each side is a dark brown, irregular area separated from the shield by a light brown line and extending almost the length of the shield; posterior to this area is a dark oval area enclosing the spiracle. Dorsal surfaces of thoracic segments two and three transversely wrinkled, the former bearing an irregular oval dark spot on either side of the middle, each spot containing a small spot from which arises a long white hair. Abdominal segments faintly transversely wrinkled. Dorsal plate of last segment slightly darker than body. Legs and prolegs of moderate size, legs reddish brown, sparsely hairy, hairs comparatively short and white. Head bearing several long,

2. Can. Ent. July, 1870, vol. II, pp. 126-128.
3. Fourth Rept. State Ent. Ill., pp. 65-74, 1889.
4. Mo. Agric. Exp. Sta. Bul. 36, pp. 73-80, 1896.
5. Manual Fruit Insects, p. 68, 1914.
6. Insects Injurious to Fruits, pp. 93-95, 1904.
7. Loc. cit.

fine hairs, each body segment bears comparatively long, fine hairs arranged more or less transversely, one row on each thoracic segment and two rows on each abdominal segment. All hairs arising from dark tuberculate bases.

The younger larva are more uniformly dark reddish brown and the body tapers more strongly from the second thoracic segment which gives the head and first segment an unusually wide appearance. At Rutherford, N. J., the larva was parasitized to some extent by *Tachina phycitae* Le Baron. Considerable damage can be done to Cotoneaster by the apple leaf-crumpler, especially by reason of its twig feeding habit. Where several are present on a twig, it is soon girdled. Moreover the leaves are small and the branches soon stripped. Arsenicals applied early in the season as in the case of infested apple trees should prove effective.

A NEW ANISOTA SPECIES FROM MANITOBA (LEPID.)

BY J. MCDUNNOUGH, PH.D.*
Entomological Branch, Ottawa.

Anisota manitobensis sp. nov.

♂.—Head, thorax, legs and abdomen a deep orange-brown; primaries somewhat deeper in color than thorax, prominently suffused in basal and terminal areas and at times along inner margin with purplish; the usual round, white discocellular spot; an oblique smoky line from apex of wing to inner margin 2/3 from base; secondaries less triangular than in *senatoria* and much less produced than in *virginiensis*, similar in color to primaries; terminal area suffused with purplish and defined inwardly by an oblique, rather broad, smoky line. Beneath much as above, rather bright in color. Expanse, 31-48 mm.

♀.—Wings paler than in ♂ sex with less purplish suffusion and with smoky subterminal lines broader, less sharply defined and shaded with purple. Expanse, 55 mm.

Holotype.—1 ♂, Aweme, Man. (July 4th, N. Criddle) in Canadian National Collection.

Allotype.—1 ♀, Aweme, Man. (June 23rd, N. Criddle) in same Collection.

Paratypes.—2 ♂'s, Aweme, Man. (June 29th, July 4th, N. Criddle) in same Collection.

The species agrees with *stigma* Fabr. in the lack of any hyaline area on the primaries of the male; it differs, however, from this species in the entire lack of any brown sprinkling and the brighter coloration, approaching in this respect nearer to the females of *virginiensis* Dru. The males before me vary considerably in size. The species has also been captured, I believe, in the neighborhood of Winnipeg.

A CORRECTION.

On page 69, line 2, read "8 p.m." instead of "6 p.m."

* Contribution from Entomological Branch, Department of Agr., Ottawa.

SYNOPSES OF SOME NORTH AMERICAN ANTHOMYIINAE (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

Herewith are presented synopses of genera of Anthomyiinae to faciliate the identification of some of the species which I have recently described in this subfamily.

Eremomyoides Malloch.

This genus is distinguished from its allies by having hairs on prosternum, propleura in centre, pteropleura, and hypopleura.

Keys to Species.

MALES.

1. Eyes separated by more than twice the width across posterior ocelli; fore tibia with 1 posterior bristle; costal setulae distinctly longer than diameter of costal vein; hind tibia with one or two bristles on anterior surface; apex of second antennal segment on inner side transverse; fifth sternite with a number of erect setulose hairs on apical half of inner margin of each process, the basal half bare.....*setosa* Stein

   Eyes separated by less than twice the width across posterior ocelli; fore tibia normally with two posterior bristles.....2

2. Eyes separated by less than width across posterior ocelli; hind tibia reddish; costal setulae weak; second antennal segment almost transverse on inner side at apex; fifth sternite with very short hairs on entire length of inner sides of processes.....*cylindrica* Stein

   Eyes separated by at least as great a distance as width across posterior ocelli; hind tibia black.....3

3. Costal setulae weak, hardly distinguishable from the costal hairs; hind tibia without an anterior bristle; thorax with three pairs of presutural acrostichals; second antennal segment angulated at apex on inner side.....*fuscipes* Malloch

   Costal setulae strong, outstanding; hind tibia with an anterior bristle; thorax with two pairs of presutural acrostichals; second antennal segment transverse at apex on inner side.....*similis* Malloch

FEMALES.

1. Fourth abdominal tergite obtusely rounded apically, curved over apex of abdomen and armed with long, dense bristles, appearing tufted .....*parkeri* Malloch

   Fourth abdominal tergite normal, not curved over apex of abdomen nor tufted, with a few bristles at apex.....2

3. Costal setulae weak, but little stronger than the costal hairs, and not longer than diameter of costal vein; mid tibia with an anteroventral and an anterodorsal bristle; apex of second antennal segment angulate at centre on inner side.....*fuscipes* Malloch

Costal setulae strong, longer than diameter of costal vein; mid tibia with an anterior bristle in addition to the other two; second antennal segment transverse at apex on inner side.....4

4. Hind tibia black; second segment of fore tarsus less than three times as long as its width at apex, third and fourth segments very much widened .....*similis* Malloch

Hind tibia rufous; second segment of fore tarsus at least four times as long as its width at apex, third and fourth segments but little widened .....*setosa* Stein

Anthomyia Meigen.

Key to Species.

1. Deep black species, without conspicuous markings.....*aestiva* Meigen
Black species with dense pale gray pruinescence and deep black markings on thorax and abdomen.....*pluvialis* Linné

Egle Robineau-Desvoidy

Only one species, *mystacea* Coquillett, lacks the distinctive bristle on the anteroventral surface of the mid tibia in the male. The bristle referred to is found in both sexes. Meigen's species, *aestiva*, does not belong to this genus but to *Anthomyia*, the propleura being hairy. The species occurs in Newfoundland and Labrador.

Key to Species.

1. Mid tibia without an anteroventral bristle; hind tibia with about 9 anterodorsal and 6 posterodorsal bristles, 3 of the latter short.....
.....*mystacea* Coquillett
Mid tibia with an anteroventral bristle near middle.....2

2. Abdomen cylindrical, pale gray pruinescent, with a series of black dorsocentral spots; hind femur usually with 4 widely spaced anteroventral, bristles on apical half; hind tibia with 1 anteroventral, 2 anterodorsal and 2 posterodorsal bristles.....*cinerella* Fabricius

Abdomen depressed, black, slightly pruinescent on each side of median line on dorsum so that when seen from behind each segment has a black vitta which is connected with an anterior transverse band and usually also with one on posterior margin.....3

3. Hind tibia with from 13 to 15 closely placed setulae on anterodorsal surface .....*hirta* Malloch

Hind tibia with from 5 to 8 bristles of irregular lengths on anterodorsal surface.....*radicum* Linné

Of the four species here listed *radicum* and *cinerella* are of general distribution and common to Europe and North America. The other two occur in the Western States at high altitudes and *mystacea* also in the extreme northwest.

Hammomyia Rondani

Generic characters: Head more or less buccate, parafacial in profile at least as wide as third antennal segment; distance between vibrissae not greater than distance of either from nearest eye-margin; abdomen in both sexes cylindrical or subcylindrical; female genitalia usually with two or more strong curved apical spines; hind tibia with at least three antero-and posterodorsal bristles; wing-veins 3 and 4 convergent apically; frons of female always less than one-third of the head-width, with or without interfrontal bristles.

Key to Species.

1. Legs entirely black, or only the knees reddish; arista with very short hairs, the longest not as long as its basal diameter.....2

   Legs with at least the tibiae entirely or in large part reddish; arista with its longest hairs longer than its basal diameter; prealar bristle absent....3

2. Prealar bristle absent; mid tibia without a ventral bristle beyond middle; abdomen with a series of dorsocentral brown spots and a brown spot at each anterior angle of each tergite.....*maculata* Stein

   Prealar bristle present; mid tibia in both sexes with one or two ventral bristles beyond middle; abdomen with a dorsocentral black vitta .....*paludis* Johannsen

3. Abdomen with a slightly interrupted central vitta and a large brown spot on lateral margin of each tergite; cross-veins of wings slightly infuscated, the outer one nearly vertical, its upper extremity very noticeably further from wing margin than its lower; female with a ventral bristle on mid tibia.....*johnsoni* Stein

   Abdomen with a complete dorsocentral vitta and a poorly defined area on anterior lateral angle of each tergite fuscous; cross-veins not infuscated, outer one oblique, its upper extremity not much further from wing margin than its lower.....*marylandica* Malloch

Pogonomyza Schnabl and Dzeidzki.

The species of this genus have the legs entirely black; proboscis very much thickened, as thick as or thicker than the fore femora; the hind tibia with more than two posterodorsal and anterodorsal bristles, and in male without a fringe of fine hairs and without a blunt posterior spine at apex of fore tibia.

All the species are northern in their distribution. One species, *flavipennis,* occurs commonly in Europe in the fall on flowers of knapweed, thistles, and ragweed, and is found in New England and eastern Canada. There are some North American species still undescribed. The larval habits are unknown to me.

Key to Species.

1. Hairs of arista very long, much longer than width of third antennal segment; prealar bristle very short.....*flavipennis* Fallen

   Hairs of arista very short, not longer than its basal diameter.....2

2 Mid femur with a number of strong bristles on apical half of anteroventral surface and two very long strong ones on basal half of posteroventral; the femora slender.....*spinosissima* Malloch

Mid femur without bristles on apical half of anteroventral surface, the bristles on basal half of posteroventral surface very short; femora noticeably thickened.....*proboscidalis* Malloch

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NEW SPECIES AND LIFE HISTORIES IN PAPAIPEMA SM. (LEPIDOPTERA) NO. 20.

BY HENRY BIRD,
Rye, N. Y.

Papaipema insulidens Bird.

Although several occurrences of this species have been chronicled since its description in 1902, it remained for the fuller biological details to be detected by Mr. F. M. Jones, of Wilmington, Del., whose western trip in 1918 produced a number of interesting results. Mr. Jones' familiarity with the larval procedure in this genus made his observations particularly valuable, but excepting this one, he reported that no other symptom of *Papaipema* work came to his notice. On August 12th, while at Sisson, California, not far from the base of Mount Shasta, an unfamiliar plant attracted his attention, and an examination proved it to be bored by some larval form of this genus. Specimens of the plant and its contained insect were forwarded to the writer, the plant ultimately being determined by Dr. N. L. Britton, of New York, as *Senecio hydrophilus* Nutt. Of the ecological situation involved, Mr. Jones writes: "Larvae sent to you inhabited a tall, coarse herb, growing very locally, in an open and wet locality—almost out of the water. The flowers were bright yellow and conspicuous, the stems hollow and rather tender. The larva enters the stem and prepares an exit thinly ceiled by papery epidermis of the stem, to, or below the ground surface, throws out little, or no frass, pupates low in the stem and prepares an exit thinly ciled by papery epidermis of the stem. At the date found, all but two had pupated (except those killed by parasites), and one of these was about to do so."

Of the twelve pupae forwarded, nine produced adults, with three falling to the usual predatory forces that follow in the wake of *Papaipema*. This mortality is of the average, after pupal change, and in a way, helps to strengthen the assumption that these larvae were doubtless following their usual trend in a preferred and primitive foodplant. Dr. Britton informs us that this section of the large genus *Senecio* has a number of closely allied species, and there is a possibility *insulidens* may take up with others also. Originally described from Vancouver Island, its range is thus extended considerably southward, and it may be assumed to follow the main habitat of the *Senecio* species serving as foodplant.

The larva seems typical of the generic series; head has the usual oblique line at the ocelli which finds a continuation in a lateral border to the cephalic

shield. The tubercles are not strongly defined, the anal plate of usual prominence, brownish, not black. The alcoholic specimen received is discolored from bacterial disease apparently, and details are indistinct. The pupa is normal, glossy and thin-shelled, so that the stigmata, though not brightly white, may be seen before emergence. It is supported in the hollow stem on a cushion of chewed fragments, at a varying distance below the exit orifice. Emergence of adults, Aug. 26 to Sept. 2. Three moths of the series have the stigmata suppressed, in the line of this frequent variation in the genus.

Papaipema nebris Gn.

The economic features connected with the introduction of the European Corn Borer, *Pyrausta nubilalis* Hub., have drawn much attention to the larval habit of *nebris* when it occasionally damages corn; because of both species being borers, the public frequently assumes to have met the former, whereas it is generally the indigenous species which is concerned. While many of its congeners will, in the first stages, attack grasses, *nebris* seems to be the only one that takes up with, and completes its transformations in corn. These attacks are simply invasions, since the females of the preceding year could not anticipate the following year's location of corn, and it is noticeable also that it is always the borders of plantings which show damage. The entry of the larva is by descent into the head of the leaf whorl, and though the plant continues to grow, the embryonic flower head is destroyed and no ears ever mature.

The Ambrosiaceae were presumably primitively preferred foodplants with this species; some of these plants, particularly *Ambrosia trifida,* are apt to occur as weeds at the borders of cultivation, and due to such occurrence, when oviposition may have been numerous at such points, the unplaced larvae of the following season have to shift to whatever may avail them. The point that we wish to emphasize is that whereas *nebris* normally furnishes an astonishing panorama of parasitism, when working in the preferred Ambrosiaceae, when in corn our observations show an almost entire absence of parasitic attack. The same holds with regard to its accidental presence in any cultivated plant and indicates that it is much to the advantage of the species to make these occasional detours. So keen are its enemies—*Macicera senilis,* Mg., and *Microplitis gortynae* Riley, (det. A. B. Gahan), being of chief import in the East—in ferreting out their host that at times total extinction in limited locations result. The parasitized larvæ offer, in the case of *Microplitis* particularly, a fruitful field to a secondary following which is numerous in point of species, and efficient in its aid to the central host. There is thus a swinging pendulum of events, registering a rise as *nebris* gains an ascendency, which may be maintained for several years, then an abrupt fall when the primary foes have gained their advantage. From this we may gather that, with the adaptability of *nebris* to so many plants of cultivation, its adventitious establishment in suitable foreign conditions would doubtless bring it into prominence as a first-class pest.

An adult *Papaipema,* undertermined and so far unencountered as a larva, has stood in our series for many years. It was a capture at light and seems to represent an individuality that is not yet recorded. The following name is proposed for it:

Papaipema placida n. sp.

Head smooth on frons, antenna simple, ringed at base by white scales. The thoracic vestiture is normal in tuftings and density, dull yellowish intermixed with purple-brown; abdomen paler, lustrous luteous. Fore wing in outline rather more falcate below apex than usual; basal area defined in the dull yellow ground color, basal line double; median field evenly defined in dull yellow except above median vein inward from reinform, where a powdering of purple brown occurs; the orbicular and claviform show as three superimposed white spots, the middle one being a mere dot; the reniform is broken into dots by the veins, clustered about the central lunulate line, and all pure white except the middle outer one, which is yellow; the median shade line is prominently marked in brown from reniform to inner margin; post-medial line is double and bends outward with pronounced sweep past reniform; subterminal area dull purplish; terminal space scarcely differentiated in paler shade; the usual apical dash is of the ground colour. Hind wing much paler, of a luteous shade of the ground color of fore wing, with the veins, a discoidal spot, a median line and a subterminal band marked in brown powderings. On the under surface the wings are glistening luteous, a median line observable and brown powderings which are deepest at the costal margins.

Expanse 31 mm.

The male genitalic structure is of the conventional pattern of the genus. In minor degree, a narrowing of the valva immediately behind the costa is noteworthy in being more pronounced than with any other species. The usual curved, and sharp-pointed harpe has its outward edge finely toothed. The unique male type is with the writer and was taken at New Brighton, Pa., (F. A. Merrick), September 6, 1907. This single example is in good condition, and unless a dwarf, indicates a small species of a coloration similar to *duovata*, or to occasional specimens of *harrisii*. From the latter and from *astuta*, it differs in the greater curve of the post-medial line.

NOTES ON A COLLECTION OF LABRADOR LEPIDOPTERA.

BY J. McDUNNOUGH, PH. D.*
Entomological Branch, Ottawa.

Through the kindness of Dr. E. M. Walker, of Toronto, a very interesting lot of Labrador Lepidoptera, collected in the vicinity of Hopedale, and a much smaller lot, taken at Nain, has passed through my hands for identification. Due to the long series of several species I have been enabled to clear up some doubtful points of synonymy and append herewith a list of the species collected with notes on certain of them. Where no definite locality is mentioned it is understood that the species were captured at Hopedale.

Pieridae.

Pieris napi frigida Scud.

I have already on two occasions discussed the status of this race (B. & McD., Contrib. III, 58, Pl. VII, figs. 1, 2; IV, 63). With a long series of

* Contribution from Entomological Branch, Department of Agr., Ottawa.

both sexes before me, captured July 7-18, it is evident that Scudder's diagnosis was based entirely on specimens of the female sex, and rather worn specimens at that. This accounts for his statement that the "secondaries of the male *frigida* are shaped as in the ♀ of *oleracea*" and that "the black scales above at the base of both wings are more profuse and widely spread." *Borealis* Grt. based on ♂ specimens will sink as a synonym.

The underside of secondaries varies in color from quite pale to strikingly bright yellow (especially marked in ♀'s) and in all cases the veins are very heavily outlined in black. On the upper side the ♂'s are pure white with the veins in the apical area marked with black; the ♀'s have at times a marked yellow tinge, are heavily sprinkled with smoky scales on primaries at base of wing and along inner margin and in well marked specimens show traces of the two subterminal spots; the veins are more suffused with black than in the ♂ sex. *Frigida* Scud. will represent the race from Labrador, Newfoundland and adjacent areas in Quebec with the partial summer generation *acadica* Edw. in Southern Newfoundland. The figures given in the "Contributions" (l. c. Pl. VII, figs. 1, 2) represent well-marked specimens of this race.

Eurymus pelidne labradorensis Scud.

The species was represented by a long series of rather indifferent specimens. I have treated of it in "Contributions III, 67, Pl. VII, figs. 6-8." Greenland and Iceland specimens must be examined before it can be determined whether the racial name is valid or should be sunk as a synonym.

Eurymus nastes Bdv.

Two specimens, Nain.

NYMPHALIDAE.

Brenthis aphirape triclaris Hbn.

Brenthis chariclea boisduvali Dup.

Both the above well-known Labrador forms were represented by good series.

Brenthis freija Thun.

A single worn specimen, taken July 26th.

Brenthis polaris Bdv.

One ♂ captured August 5th.

SATYRIDAE.

Oeneis jutta Hbn.

A worn ♂, captured on August 2nd at Hopedale; another ♂ from Nain.

Oeneis taygete Hbn.

Several good specimens of both sexes captured between July 25th and August 23rd.

Oeneis oeno Bdv.

A small series of both sexes was present.

My idea of this species was given in "Contributions IV, 68" and I still adhere to this opinion. Besides the Labrador specimens several from the north shore of the Gulf of St. Lawrence are before me, captured by C. H. Young at Rocky Bay; these cannot be separated from the Labrador specimens

in maculation but in the ♂ genitalia show slight divergences and are the exact counterpart of the figure of the genitalia of *katahdin* given in "Contributions Pl. XXX, fig. 1." Under these circumstances it would appear that *katahdin* should be considered as a geographical race of *ocno* and not as a good species. I give figures of the genitalia of the Labrador and Gulf Coast forms, the main point of distinction is found in the width of the valves at their distal end.

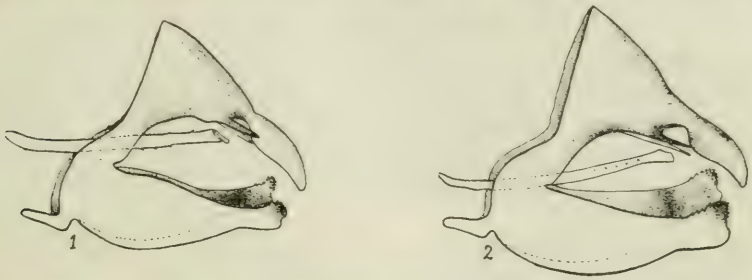

Fig. 1. Male Genitalia of *Oeneis ocno* Bdv. from Labrador.
Fig. 2. Male Genitalia of *Oeneis ocno* Bdv. from Rocky Bay.

LYCAENIDAE.

Plebeius scudderi Edw.

As far as I know this species has not been captured in Labrador since it was recorded by Moeschler (1873, Stett. Ent. Zeitschr. 155). A small series of both sexes, taken in August, was present and the specimens are quite typical, the male showing scarcely any traces of the red submarginal lunules on the underside of primaries; the ♀ is heavily shaded with blue on the upper side without or with mere traces of orange lunules above the black submarginal spots of secondaries.

Plebeius aquilo Bdv.

This well-known Arctic form was represented by a few worn specimens.

Heodes dorcas Kby.

A single ♀, captured August 15th, very closely resembles Kirby's figure in the Fauna Boreali-Americana. I am not aware that the species has been recorded from Labrador but the record is not surprising as the species is a distinctly northern one.

Hesperia centaureae Ramb.

AGARISTIDAE.

Androloma mac-cullochi Kby.

Two specimens, taken July 14th and August 23rd.

NOCTUIDAE.

Epipsilia okakensis Pack.

Only a single pair of the species from Hopedale was present which is rather surprising as it is one of the commonest species in the region; a small series occurred in the lot from Nain.

Epipsilia quadrangula Zett.

A good series, illustrating the variability of the species in regard to the depth of maculation and the intensity of the black areas around the reinform and orbicular.

Anomogyna sincera H. S.

A single specimen without date of capture. The species has been recorded from Labrador on the authority of Moeschler, but this is the first authentic specimen which has passed through my hands. It agrees well with the figure in Spuler, Schmett. Europas. Pl. XXXIII, fig. 1.

Anarta richardsoni Curt.

One ♀, captured July 18th, Hopedale; several specimens from Nain.

Polia pulverulenta Sm.

One ♀, captured August 6th. The record is a new one although not surprising as the type specimens were taken at Orono, Me., where so many northern forms have been located. Figures of the species will be found in the Barnes & McDunnough Contributions, Vol. IV, Pl. XVI, figs. 2, 3.

Sympistis melaleuca Thun.

A good series was present: there is considerable variation in the amount of black suffusion on the primaries.

Trichoplexia exornata Moesch.

One ♀, captured August 5th.

Eremobia maillardi exulis Lef.

Two ♂'s and one ♀ of this variable species were included in the Hopedale lot; they all belong to the form without white streaks on the veins. One specimen from Nain was also present.

Hyppa xylinoides Gn.

One ♂, taken July 18th, seems best referred to this species although the color is rather darker and the white patch above the anal angle reduced to a narrow line. More material will be necessary to determine whether we are dealing with a racial form or not.

Autographa arctica Moesch.

Of late years a few stray specimens of this species have passed through my hands; the present collection contains a long series, however, which conclusively shows that *arctica* from Labrador and *vaccinii* Hy. Edw. from Mt. Washington, N. H., are specifically identical. Both show the same finely waved t.p. line and vary similarly in the amount of black suffusion on the central portion of primaries.

Arctica was originally treated as a Labrador race of *u-aureum* Gn., described with type locality, Dalecarlia. Aurivillius, in his paper on the Insects of Greenland (1890, Bihang K. Sv. Vet. Akad. Handl. XV. Afd. IV, p. 16), makes it a pure synonym of *u-aureum* along with *groenlandica* Staud. and figures the species on Pl. 1, fig. 7. This figure corresponds remarkably closely to our Labrador specimens. Hampson (1913, Cat. Lep. Phal. Brit. Mus. XIII, 424, 432) separates *u-aureum* Gn. and *groenlandica* Staud., making *vaccinii* Hy. Edw. a synonym of the former and figuring the species (Pl. 236, fig. 16) from a North American specimen. Under *groenlandica* he cites *arctica* Moesch. and *u-aureum* Auriv. (nec Gn.). His figure of *groenlandica* (Pl. 236, fig. 23), drawn from an Iceland specimen, certainly appears to represent a species distinct from his other figure but does not agree with Aurivillius' figure above mentioned either in the shape of the gamma-mark or the wavy nature of the t.p. line. Further under *u-aureum* he cites no European localities for the

species and is followed in this by Warren in Seitz, Macrolep. Palaearc. Noct. who makes no mention of *u-aureum* as being Palaearctic. It would almost seem as if European lepidopterists had agreed that the locality 'Dalecarlia,' given by Guenée was erroneous and that the name *u-aureum* was based on Greenland or Iceland specimens; I have seen, however, no published notice to this effect.

Ottolengui (1917, Ent. News XXVIII, 29) treats of *vaccinii* and its synonymy but makes no mention of *arctica* Moesch.

The identity of *u-aureum* and *groenlandica* being in doubt I am obliged to leave them out of consideration for the present; if Aurivillius be correct Guenée's name will take priority; in the meantime the species should be known as *arctica* Moesch. with *vaccinii* Hy. Edw. as a subspecies of doubtful value from New Hampshire and possibly adjacent mountain peaks.

Syngrapha diasema borea Auriv.

A single ♀ specimen corresponds excellently well with Aurivillius' description and figure (op. cit. 17, Pl. 1, fig. 8); this race is said to differ from the type form from Northern Europe in the distinctly yellow coloration of the central area of secondaries with moderately broad smoky border. I have always been inclined to associate a form found in the Rocky Mountains of Canada with *borea;* this same form has recently been treated as a new species by Dr. Ottolengui (1919, Jour. N. Y. Ent. Soc. XXVII, 121, Pl. XV, fig. 2) under the name *diversigna*. With a Paratype and a series of five males from Nordegg, Alberta, before me, I have made a careful comparison with the Labrador specimen and fail to find any characters which would warrant specific distinction; the Alberta specimens are slightly smaller and the yellow of secondaries somewhat brighter and if desired the name *diversigna* Ottol. may be retained to designate the Rocky Mountain race; for the Labrador and Arctic race which is certainly easily separated from *diasema* by the color of the secondaries Aurivillius' term *borea* should be used and the synonymy would thus stand.

diasema Bdv. N. Europe.

(a) *borea* Auriv. Greenland, Labrador.

(b) *diversigna* Ottol. Canadian Rocky Mountains.

LYMANTRIIDAE.

Gynaephora rossi Curt.

One pair of this well-known Arctic form.

GEOMETRIDAE.

Acidalia frigidaria Moesch.

A series of this well-known form captured July 12th-20th shows considerable variation in the distinction of the transverse lines which at times become almost lost in the general gray ground-color.

Carsia paludata labradoriata Moesch.

One specimen.

Dysstroma citrata Linn.

A couple of rather worn specimens taken 23rd August. These were of the dull gray form with slight ruddy subterminal suffusion and with median band rather paler than the remainder of the wing, due to less heavy sprinkling of gray scales. This appears to be the usual form in northern localities.

Xanthorhoe designata Hufn. . .

A small series, rather worn, captured between July 25th and August 6th.

Xanthorhoe algidata Moesch.

The identity of this species has always been doubtful; the general conception, following a specimen in the British Museum, is that it is a species closely allied to *fossoria* Tayl. A single ♂ before me fits these requirements although not agreeing very closely with the original description as regards the details of the median band. For the present I identify it tentatively as *algidata*. The genitalia seem distinct from those of the other members of the group as far as I can judge from Swett's paper (1918, Can. Ent. L, 17) with little or no material before me for comparison. The costa is narrow apically and bears a bunch of long spines directed inward.

Xanthorhoe ferrugata Clerck.

A number of specimens captured in July and considerably the worse for wear.

Euphyia luctuata obductata Moesch.

Apparently one of the commonest geometers of this region; some specimens show traces of a narrow pale band on secondaries.

Eulype hastata Linn.

One specimen, taken August 5th, of the typical form.

Dasyuris polata Dup.

Two ♀'s, captured August 21st and 22nd.

Eupithecia sp.

Several specimens too worn for identification.

Macaria granitata sexmaculata Pack.

Four specimens which presumably may be referred to this race.

Aspilates orciferaria labradoriata Moesch.

A good series, the ♀'s showing a decided yellowish tinge to the primaries

PYRALIDAE.

Nomophila noctuella Schiff.

Two specimens taken early in August.

Scoparia centuriella Schiff.

A number of small, rather dark specimens.

Laodamia fusca Haw.

One male.

Platyptilia carduidactyla Riley.

Two specimens of this species, kindly identified for me by Dr. A. Lindsey; the species has to my knowledge not been previously recorded from Labrador.

GELECHIIDAE.

Gelechia continuella Zell.

One specimen. This European species has been twice described from North America under the names *trimaculella* Pack. and *albamaculella* Cham. Mr. A. Busck informs me that he has recently made slides of the ♂ genitalia of specimens from both continents and they prove to be identical, establishing the above synonymy.

TORTRICIDAE.

Olethreutes intermistana Clem.

Three specimens; kindly identified by Mr. A. Busck of the U. S. National Museum.

Tortrix moeschleriana Wocke.

Two specimens.

Cnephasia osseana Scop.

Three specimens; identified by Mr. A. Busck.

TINEIDAE.

Monopis biflavimaculella Clem.

Four specimens.

CRAGIN'S COLLECTION OF KANSAS MYRIAPODA.

BY HORACE GUNTHORP,
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The first Myriapod record for the State of Kansas is that of Wood (8, pg. 11)[1], who reported the single form *Scolopendra polymorpha* from Fort Riley, Kansas, in 1861. This constituted the sole record for the state until 1885, when Meinert (7, pg. 196) reported *Scolopendra heros* from Riley, Kans. As he considered *S. polymorpha* a synonym of *S. heros,* forms now known to be distinct, he was undoubtedly dealing with the former, as there is no authentic record of *S. heros* occurring as far north in Kansas as Fort Riley, so he cannot be said to have added a new name to the state list. The same year W. F. Cragin (5) published a short list of Kansas Myriapoda in which he enumerated twelve forms covering some nine species in seven genera. In 1893, Bollman (2, pg. 183) placed *Parajulus venustus* on the Kansas list.

No new forms were added until 1913, when the present writer published a more extended catalogue, covering more extensive collecting over the state. This latest list included a total of fourteen species of Diplopoda and fifteen of Chilopoda.

At the time of publishing this last mentioned paper, an effort was made to examine the collection evidently made by Professor Cragin, with the result therein recorded (6, pg. 168) which was as follows: "Through the kindness of Prof. C. H. Edmundson, of Washburn College, I have examined two individuals of this species (*Scolopendra heros*) collected by Cragin in Barber County. The larger one measures 140 m. These two specimens are all that remain of Prof. Cragin's Myiapoda collection, as the remainder were destroyed by fire." This fire occurred in 1908.

During the past year, while the writer was rearranging the specimens in the museum at Washburn College, a perforated board holding some fifty bottles of specimens came to light, some of which, upon examination, proved to be part of the Myriapoda collected by Cragin. This led to a systematic search of the laboratories and store rooms, with the result that a total of twenty bottles plus one dried, pinned specimen were found. With the exception of the latter, there is little doubt but that they are all from one original collection, in

[1]Numbers in parenthesis refer to bibliography at end.

spite of the fact that some of them unfortunately have no labels. This gave the writer a chance to check Cragin's published list with probably most of the material originally used by him, and revise the list of Kansas Myriapoda, with the results recorded below. The collections will be deposited in the Museum of the University of Kansas.

DIPLOPODA.

Fontaria virginiensis (Drury).

Cragin reports "Two specimens from Kansas Valley Woods, Shawnee Co." There are two bottles of this species in the collection. One contains two specimens, and is labeled "*Polydesmus virginiensis* (Drury), Topeka, Cragin." The other contains one specimen from "Baxter Springs, Ks., Dr. J. M. Duncan." As Topeka is in Shawnee County, it is evident the first bottle contains the specimens referred to by Cragin.

Leptodesmus placidus (Wood).

Cragin records, under the name *Polydesmus floridus,* three specimens from near Thompsonville, Jefferson Co. None in the collection.

Polydesmus pinetorum Bollman.

Cragin does not record this form, but there are five male specimens in the collection labelled "Topeka, Cragin."

Polydesmus serratus Say.

Cragin does not mention this, but there are three specimens, without labels in the collection.

Lysiopetalum lactarium (Say).

Cragin does not record this, but there is one specimen in the collection labelled "Topeka, Cragin."

Arctobolus marginatus (Say).

Not recorded by Cragin, but there are nine specimens in the collection, all wthout labels except one, which is from "Topeka, Ks., L. A. Whitney." Seven of these are without heads!

Tylobolus uncigerus (Wood).

Cragin reports this species under the name *Spirobolus uncigeris* from Shawnee County. As the writer has previously stated (6, pg. 164), other recorded localities for this species are restricted to California and Oregon. It is not to be found in the collection, which fact, taken together with its known distribution, leads to but one conclusion, i.e., it should be stricken from the list of forms in the state. From the mutilated condition of the above mentioned specimens of *A. marginatus* it is quite possible that their identification caused trouble and they were recorded as *uncigerus.*

Parajulus venustus (Wood).

Cragin says, "Specimens of *Iulus* are abundant in Shawnee Co., but I shall not be able to report upon any of them in the present contribution." (5, pg. 145). One specimen in the collection, labeled "*Julus venustus,* Topeka Cragin" appears to be this species.

CHILOPODA.

Scutigera forceps (Raf).

Recorded from Shawnee, Labette, and Barber Counties by Cragin. Seven specimens in collection, one from "Under old beam, Washburn Col., Topeka, May 9, 1884," and another from "Newton (Harvey Co.) Kans."

Lithobius forficatus (L.)

Not recorded by Cragin. One specimen, dried, in case with insects, labeled "Topeka." Probably not one of Cragin's collection.

Lithobius transmarinus (Koch).

Cragin reports this form from Barber Co. under the name *Neolithobius mordax*. One specimen in collection, in bottle containing no label.

Otocryptops sexspinosus (Say).

Not recorded by Cragin, although the present writer so stated in his report (6, pg. 167). Three specimens in collection, without label.

Scolopendra heros Girard.

Cragin reports this form under three varieties, *S. heros, S. heros,* var. *castaneiceps* Wood, and *S. heros,* var. nov. *prismatica*, the distinguishing characters of the latter being "The superior surface of each scutum, except the first and last, may be said to be bounded by three planes, one horizontal and two sloping from either of the same and making with it a clearly-cut angle, giving the appearance of a double bevel. The general color of the specimen in alcohol is deep purplish-black, in sharp contrast with the bright orange-brown of the head and first body segment; feet greenish-yellow, the last pair concolorous with the body, and a little stouter than in the typical species." (5, pg. 144). All of above forms he records from Barber Co. only.

There are five specimens of this species in the collection, all labeled "Barber Co., Cragin." One of these may be the type of Cragin's variety *prismatica*, as the back distinctly shows the three planes as described above, but the color has all faded to a yellowish-orange, and there is no special label to distinguish it from the other specimens. The head is distinctly that of *S. heros*, and so are the prosternal teeth. The pseudopleural processes bear five and seven spines. The prefemur of the anal legs bears eight and seven spines on the ventral surface, and five and six respectively on the inner surface. This variation in number of spines is probably due to the fact that one anal leg is smaller than the other, due to regeneration. The apical processes bear five and nine spines. While these numbers are slightly below the average, they can hardly be said to form grounds for the formation of a new variety, and the peculiarity of the back seems to be only a slight exaggeration of a condition found in other specimens of this species.

Scolopendra morsitans L.

Reported by Cragin from Barber Co. under the variety name *coerulescens*. His description follows: "A centipede with antennae 20-jointed, I refer here provisionally, though it differs in some respects from the characters given by Newport and Wood for this species, and though the latter author has expressed his belief that *S. morsitans* is not an inhabitant of the United States. The color is a uniform light blue, or greenish blue, pale, almost to translucent, the legs being nearly colorless and transparent. The mandibles are dark green,

in sharp contrast with the light-bluish hue of the mouth-parts, which are concolorous with the head and body. The entire animal is of a more delicate structure than is usually seen even in small specimens of the genus. The reflexed antennae cover about four segments of the body. The length is a little over an inch. These characters will suffice to distinguish this variety of *morsitans,* if I am right in referring it to that species; but I shall elsewhere give the details of its form and armature.

"Newport states that the range of *S. morsitans* includes the tropical and subtropical portions of the New World, and an unknown portion of China. In view of the many subtropical features in the fauna of Southern Kansas that have already come to light, the discovery of this species in that region need be hardly a matter of surprise. Our specimen was found under a stone on the summit of a high hill in Barber Co., about 500 feet above the Medicine River at Medicine Lodge."

Bollman (1, pg. 174) lists this variety as a synonym of *S. morsitans,* but states that it may not be such, as Cragin's "description is so indefinite that it is almost impossible to tell to what species it may belong." This record for the species has evidently been accepted by Chamberlin (3, pg. 479), as he says, "In the United States known from Georgia, Florida, Kansas, Utah, and California." It is probably best to let it stand until more extensive collecting in the southwestern part of the state has cleared the matter up. There is no specimen referable to this species in the collection, nor one which corresponds to Cragin's description.

Scolopendra polymorpha Wood.

Recorded from Rice, Finney and Barber Cos. by Cragin. There are three specimens in the collection, but with no labels.

A corrected list of the known Myriapoda occurring in Kansas at this writing would be as follows:—

DIPLOPODA.

Fontaria virginiensis (Drury); *Leptodesmus hispidipes* (Wood); *Leptodesmus placidus* (Wood); *Oxidus gracilis* (C. L. Koch); *Polydesmus pinetorum* Bollman; *Polydesmus serratus* Say; *Scytonotus granulatus* (Say); *Cleidogona* sp.; *Lysiapotalum lactarium* (Say); *Arctobolus marginatus* (Say); *Parajulus diversifrons* (Wood); *Parajulus impressus* (Say); *Parajulus venustus* (Wood).

CHILOPODA.

Scutigera forceps (Rafinesque); *Lithobius forficatus* (Linnaeus); *Lithobius transmarinus.* Koch; *Nadabius jowensis* (Meinert); *Tidabius kansensis* (Gunthorp)[2]; *Pokabius bilabiatus* (Wood)[3]; *Otocryptops sexspinosus* (Say); *Scolopendra heros* Girard; *Scolopendra morsitans* Linnaeus; *Scolopendra polymorpha* Wood; *Arenophilus bipuncticeps* (Wood); *Arenophilus osborni* Gunthorp; *Geophilus dolichocephalus* Gunthorp; *Geophilus mordax* Meinert; *Linotaenia fulva* (Say).

[2]*Lithobius kansensis* Gunthorp. (6, pg. 166). This species should be placed in the genus *Tidabius* recently created by Chamberlin (4, pg. 80).

[3]*Lithobius bilabiatus* Wood. Proc. Phil. Acad., 1867, p. 130.
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NOTES ON COCCIDAE VIII. (HEMIPTERA).

BY G. F. FERRIS,
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A Review of MacGillivray's "The Coccidae."

(Continued from page 61).

The establishment of a separate subfamily for the peculiar genus *Apiomorpha* is perhaps justified, but I cannot agree with MacGillivray in assigning to the Apiomorphinae such forms as *Asterolecanis* and *Opisthoscelis*. The latter I suspect to be related to *Capulinia*, which MacGillivray refers to the Cylindrococcinae. As to the first named I have specimens but no opinions concerning them except that I cannot connect them with any of the other Coccidae.

The subfamily Cylindrococcinae is simply a heterogeneous assemblage of doubtful forms. I am unable to see any special connection between such genera as *Halimococcus, Phoenicococcus, Capulinia* and *Cylindrococcus*, of all of which I have specimens. But I must confess to a total lack of knowledge as to what should be done with them. MacGillivray has retained Brittin's genus *Scutare* in the Conchaspinae, yet Green, who has examined specimens, states that it does not belong in the group and refers the single included species to *Rhizococcus*. Judging from Brittin's figures and description I am inclined to agree with Green that it does not belong in the Conchaspinae. However, I believe the genus to be valid, although I cannot say where it belongs. Following Newstead MacGillivray records the presence of abdominal spiracles in this subfamily. Judging from preparations that are of the best I cannot agree that the structures in question are spiracles. There is no visible opening and the appearance is the same as that of the pair of ventral tubercles that appears for instance in *Kuwanina*.

The subfamily Disapidinae has been the special recipient of MacGillivray's attention and occupies 249 of the 465 pages of text in the book. Throughout this subfamily the storm of genus making has raged, reaching its climax in the Aspidiotini, and of the old genera there remain nothing but fragments. I count 116 new genera in the sub-family. To attempt to analyze these genera in anything short of another book is impossible and I shall content myself here with discussing only a few of the most remarkable results and some of the most obvious errors. Yet the commission of such errors as some of these are is sufficient to cast doubt upon the value of MacGillivray's conclusions in general. It is conclusive evidence that he has not attained to that knowledge and understanding of the group that should have preceded any such wholesale rearrangement as he has undertaken.

In the general discussion of this subfamily I note two errors that may be of some importance. On page 218 it is stated that in the first stage nymphs the distal segment of the antennae "is long and constricted and appears as if composed of several segments." This is true of only a part of the group, for in some species the distal segment is short and not at all annulated. On page 220 it is said that when the insects of the second stage molt "there is no variation in the way in which the cuticle ruptures." However, in some forms such as certain species of the genus *Odonaspis* (as previously understood), the ventral skin separates entirely from the dorsal and is incorporated in the ventral scale.

I am not entirely in accord with MacGillivray's arrangement of the tribes in this subfamily, although this is not original with him. I consider that the various groups of species in which the adult remains enclosed within the second exuvia are, with certain exceptions, derivatives of forms that are included in the various other tribes and that separate tribes for such groups as the Leucaspidini and Fioriniini tend merely to obscure their real relationships. Furthermore I consider the distinction between the tribes Lepidosaphini and Disapidini to be entirely artificial. The genus *Aucepaspis*, which MacGillivray attaches to the Aspidiotini I consider to represent an independent group.

In many cases throughout the subfamily MacGillivray has separated genera on the basis of the presence or absence of the paragenital pores, the "genacerores." That the consistent following of this practice results in artificial groups seems to me evident as for instance in the case of the genera *Lineaspis* and *Cupidaspis*, the types of which are scarcely separable specifically except for this difference. Such splitting as this may be convenient but it does not express the relationships of the forms involved.

The peculiar combinations obtained by MacGillivray's methods begin to appear in the tribe Parlatoriini where *Parlatoria chinensis* Marlatt and *P. pyri* Marlatt are referred to the genus *Cryptoparlatoria* with *C. leucaspis* Lindinger as type. If specimens before me as *C. leucaspis* be correctly determined such an arrangement is quite untenable.

In the Leucaspidini two such utterly different species as *L. indica* Marlatt and *L. kelloggi* Coleman are placed together in *Suturaspis*. The latter species, in fact, does not even belong in this group for the adult female is not enclosed within the exuvia of the preceding stage. Under the Lepidosaphini I have scarcely a large enough representation of the species to permit comments. I may note, however, that the genus *Aonidomytilus* is retained as separate on the basis of the supposed absence of plates cephalad of the anal lobes—although these plates are present as I have shown in another paper. Also *Lepidosaphes mexicana* (Ckll.) which MacGillivray places in *Triaspidis*, really runs to *Leonardaspis* if it runs any place.

In the tribe Diaspidini the genus *Diaspis* is separated from *Cockerellaspis* and *Epidiaspis* by reason of its having the "Pygidium with caudal margin deeply concave on meson with median pair of lobes in concavity. . ," yet *Diaspis calyptroides* Costa, the type of the genus, has not the slightest trace of such a character and *D. phoradendri* Ckll., which MacGillivray retains in *Diaspis* has the median lobes extremely prominent. *Diaspis toumeyi* Ckll., which is referred to *Pseudaulacaspis* is a species of the same type as *D. texensis* Ckll. and *D manzanitae* (Whitney) which are retained in *Diaspis*.

I am entirely unable to concur in the separation of *Essigaspis*, with *Protodiaspis agrifoliae* Essig as type, and *Obluctaspis*, with *P. lobata* Ferris as type, from *Protodiaspis*. On the other hand MacGillivray has retained in *Protodiaspis* the species *P. pulchra* Ferris which might well have been taken out. Furthermore he has left in this genus, where they certainly do not belong the two species *edentata* Ferris and *anomala* Green, while the genus *Ancepaspis* to which they do belong, has been transferred to the Aspidiotini! I consider that *Ancepaspis* really represents a distinct group.

The two genera *Aulacaspis* and *Phenacaspis* are apparently closely related, at least in part, for some of the species referred to the latter genus, such as *P. mischocarpi* Ckll. and Rob., appear really to belong to the former. This fact appears entirely to have escaped MacGillivray's notice. It has long been apparent that the genus *Chionaspis* was in need of limitation. The process was begun by Cooley and has been contained by MacGillivray with none too fortunate results. Such peculiar forms as *C. etrusca* Leonardi and *C. spartinae* Comst. are retained in *Chionaspis* when they might well have been removed, while such a form as *C. caryae* Cooley which is really rather close to typical *Chionaspis* is taken out.

I believe that it has already been pointed out that *Hemichionaspis* is a synonym of *Pinnaspis*. Certainly if specimens in my hands determined by Cockerell as *P. buxi* be correctly named there is no doubt that it is. Yet MacGillivray places *Pinnaspis* in the Lepidosaphini and *Hemichionaspis* in the Diaspidini.

Chionaspis striata Newstead is made the type of the genus *Lineaspis* and *Leucaspis cupressi* Coleman the type of *Cupidaspis*, yet the two species differ only in the fact that the former possesses "genacerores" while the latter does not. I regard them as congeneric and for them the name *Lineaspis* will stand.

A new genus, *Situlaspis,* has been named for *Pseudodiaspis condaliae* Ferris, yet this species is no farther from the type of *Pseudodiaspis* than are the others that are retained in that genus.

In the tribe Aspidiotini there are before me specimens of *Furcaspis biformis* (Ckll.) which show that MacGillivray's conception of this genus is entirely distorted. He has excluded from this genus two species, *haematochroa* Ckll. and *occanica* Lindinger, which seem really to belong to it and has referred them to the genus *Spinaspidiotus* together with such a species as *Aspidiotus pangoensis* Doane and Ferris with which I can not believe that they have anything at all to do. Conversely he has referred to *Furcaspis* such species as *Aspidiotus jordani* Kuwana and *A. juglans-regiae* Comst.—a truly remarkable combination.

He has, I say, placed *Aspidiotus juglans-regiae* in *Furcaspis,* while under *Quadraspidiotus* appear *A. glanduliferus* Ckll. and *A. fernaldi* Ckll, the former of which is certainly and the latter almost certainly a synonym of *juglans-regiae.*

The former *Targionia helianthi* (Parrott) appears as the type of *Rhizaspidiotus, T. gutierreziae* (Ckll.) as the type of *Chorizaspidiotus,* and *T. chenopodii* Marlatt as the type of *Remotaspidiotus*—yet the three are scarcely separable specifically.

Under *Neosignoretia* appears *Aspidiotus yuccae* Ckll., which I have elsewhere referred to *Pseudodiaspis* and which is a Diaspidine form, and associated with it is *Aspidiotus yulupae* Bremner which I regard as a synonym of *A. osborni* Ckll. and Newell, the latter being placed under *Diaspidiotus.*

Targionia yuccarum (Ckll.) is made the type of a new genus, *Targaspidiotus.* I reaffirm my former opinion that it is a true *Targionia.* The species described by Marlatt as *Aonidia juniperi* (and which I believe to be a true *Aonidida*) is referred to *Targionia,* while *Aspidiotus shastae* Coleman, of which *juniperi* is a synonym, is referred to *Gonaspidiotus* in company with such strange companions as *Aspidiotus graminellus* Ckll.

Xerophilaspis, referred by MacGillivray to the Aspidiotini, in my opinion belongs in the Diaspidini.

Under *Comstockiella* appears *Aspidiotus riverae* Ckll. which belongs somewhere in the Diaspidini.

Aspidiotus anonae Houser (which is a synonym of *A. herculeanus* Doane and Hadden) is made the type of the genus *Clavaspis,* while *A. subsimilis* Ckll. of which *anonae* was formerly regarded as a variety is referred to *Hendaspidiotus.* While I can not consider that *herculeanus* is a "variety" of *subsimilis* the two are certainly so closely related that to place them in separate genera seems inexcusable. *Aspidiotus coursetiae* Marlatt, which is another species of the same group, is placed in *Diaspidiotus,* while *Aspidiotus covilleae* Ferris, which is very close to if not identical with *coursetiae,* is placed as the type of a new genus, *Ferrisaspis.* I must regretfully reject the honor thus done me.

I repeat that the instances which I have cited above are simply a few of the examples to be found in the treatment of the Diaspinae. An extended analysis will show many others equally worthy of criticism. I can not believe that such work as this can do anything more than extend the confusion already existing in the group.

THE ACADIAN ENTOMOLOGICAL SOCIETY.

It will be of interest to many of the readers of the "Canadian Entomologist" to learn that at the last meeting of the Entomological Society of Nova Scotia, held recently in Halifax, it was decided to broaden out this Society into a Maritime one to include the three provinces, Nova Scotia, New Brunswick and Prince Edward Island.

The name of the Society was also changed from the Entomological Society of Nova Scotia to the Acadian Entomological Society, this name being chosen on account of the fact that the territory embraced by the new Society includes practically the same area as did the ancient Acadia.

The Entomological Society of Nova Scotia has been steadily increasing in numbers and influence since its organization in 1915, and it is felt that this change is another decided step in advance.

NOTE ON THE ROSY APHIS.

BY A. C. BAKER,
Bureau of Entomology, Washington, D.C.

In 1916 W. F. Turner and the writer published some results of a study of the rosy apple aphis. We found that the insect was quite distinct from *A. sorbi* Kalt. of Europe, and, following the lead of Mr. Pergande, we used *malifoliae* Fitch for the species. At the time we had access to only a few of Mr. Pergande's notes and were unaware that he had made studies on *sorbi* in Germany. These studies convinced him that *sorbi* and the rosy aphis are distinct. Theobald reached the same conclusion in England and Gillette from Russian material was equally convinced. All who studied actual material agree, therefore, that two forms are concerned.

At the time we wrote our paper the Fitch type of *malifoliae* was thought to be lost but this has since been located in a group of slides presented to the National Museum by Miss Pergande. This material still bears the original Fitch note book numbers. The species, however, is *crataegifoliae* Fitch, the type of which is also in the National Museum collection. The rosy aphis, therefore, is again without a name, as the former names given it all refer to different insects. We herewith give the species the name ANURAPHIS ROSEUS. A full discussion of the synonymy will be given in a paper on the genus *Anuraphis* which will soon be ready for the press.

OBSERVATIONS ON JOHNSONOMYIA FELT WITH A DESCRIPTION OF A NEW SPECIES.

BY E. P. FELT.
Albany, N. Y.

The genus *Johnsonomyia* Felt was erected in 1908 for the reception of a peculiar species collected in Vermont by that ardent and discriminating Dipterist, Mr. C. W. Johnson of the Boston Society of Natural History. A related species was found to occur rather commonly in the vicinity of Albany, a unique representative from Guatemala was described in 1912 and a closely allied species from Brazil in 1915. The types of these, *J. cincta* Felt and *J. braziliensis* Felt, are deposited in the U. S. National Museum and the Cornell University collections respectively. There has just come to hand a most remarkable form from Africa and this in connection with the probable close relationship of the Australian *Chastomera* Skuse indicates a presumably world wide distribution for this peculiar genus, which latter is probably characterized by the possession of 16 antennal segments and has the wing venation of a Porricondylid, though the distinctly heavier veins, the simple fifth vein and the marked hairiness of the wing membrane suggests something unusual, which in connection with the absence of circumfila, has led to the placing of the genus in the Heteropezinae.

Johnsonomyia alexanderi n. sp.

The giant midge characterizing herewith was recently received through the kindness of Dr. C. P. Alexander of the Illinois State Natural History Survey. It was labelled Efulan, Cameroun, V-6-1920, J. A. Reis, Coll. A perusal of the following description shows this giant midge to be a strikingly marked form entirely different from anything heretofore brought to notice.

Female. Length 8 mm. Antennae extending to the fourth abdominal segment, rather thickly haired, mostly light brown, the stems whitish transparent, and probably 16 segments, the first and second segments short, stout, dark brown, the fifth with a stem nearly equal to the length of the basal enlargement, which latter has a length about 2½ times its diameter and is irregularly clothed with setae, there being sub-basally and sub-apically a few very long, dark setae, the interspaces rather thickly filled with shorter, light setae; Palpi presumably quadriarticulate, indistinct in the mount; mesonotum a dull reddish brown; scutellum and postscutellum concolorous; the abdomen sparsely haired, dark brown; the ovipositor dark reddish orange; wings sub-hyaline, the membrane rather thickly clothed with fuscous hairs, sub-costa uniting with the anterior margin at the distal third, the third vein joining the margin well beyond the apex of the wing and united to sub-costa near the basal half by a distinct cross vein, the fifth simple and joining the posterior margin a little before the basal half; halteres dark brown; coxae and legs dark brown except the basal half of tibiae and the distal four tarsal segments, which latter are snow white and suggest the ornamentation of Bittacomorpha clavipes Fabr; claws moderately long, stout, black, apparently simple; the pulvilli rudimentary; ovipositor short, the lobes narrowly oval, with a length about three times the width and thickly setose.

Type A. 3196, N. Y. State Museum.

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JOHN MACOUN MEMORIAL.

At the request of naturalists generally throughout Canada, the Ottawa Field-Naturalists' Club has decided to receive subscriptions for a permanent memorial in honor of the late Prof. John Macoun, Naturalist of the Geological Survey of Canada, who died at Sidney, B. C., on July 18, 1920.

The wide field of natural history work to which John Macoun devoted his life is well known, not only throughout Canada but in other countries as well. He specialized particularly in botany and was the founder of the Canadian National herbarium. Other sciences, however, especially zoology, were also greatly enriched by him; he will always be remembered as a great pioneer in Canadian natural history.

Many friends of the late John Macoun, particularly in Toronto and Ottawa, have thought that the memorial should take the form of a painted portrait to be hung in the Victoria Memorial Museum. Such a memorial has now been decided upon and a painting will be made by Mr. Franklin Brownell of Ottawa, the well-known portrait painter. Expenses in connection therewith will be about $700.

Subscriptions to this fund should be forwarded to Mr. Arthur Gibson, Dominion Entomologist, Ottawa.

Should the list be oversubscribed arrangements may be made whereby those subscribing above a certain sum, which now cannot be defined, will receive a reproduction of the painting.

A. G.

POPULAR AND PRACTICAL ENTOMOLOGY.

PARASITES OF THE PALE WESTERN CUTWORM IN ALBERTA.

BY E. H. STRICKLAND,
Entomological Branch, Ottawa.*

The pale western cutworm, *Porosagrotis orthogonia* Morr., has been, since 1911, the most destructive insect pest of grain crops in southern Alberta and in a small area of south western Saskatchewan.

The damage in some years amounts to considerably over a million dollars, and all control measures so far employed have proved to be unsuccessful when they are applied to large areas of infestation. For this reason natural control is of superlative importance.

The larvæ of this species are almost entirely subterranean in their habits, and they are never seen above ground by daylight. Hence they are practically immune from destruction by the all too scarce prairie birds. Some fall prey to predators such as *Calosoma frigidum* Kby. and *Ammophila* species, but these represent a very small percentage. No signs of disease have been observed, the

* Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

winter is passed in the egg stage which appears to be little affected by freezing, and the larvæ cannot be drowned, even with excessive irrigation.

Although the species occurs throughout the Great Basin region of the United States, in which it is recorded from five States, it has never appeared there in destructive numbers. Recently it has increased in Montana to an alarming extent.

In the Montana Agricultural Station Circular No. 94, (1920) the statement is made that the "pale western cutworm, remaining as it does below the surface of the ground, is protected from the attacks of parasitic insects." The absence of parasites in this species in Montana has been commented upon in correspondence to the writer both by Professor Cooley, and Mr. J. R. Parker.

This condition is very much at variance with that experienced in Alberta, where parasites are of great importance, and significance. We are able, in most seasons, to predict the severity of outbreaks by a study of the parasite conditions of the previous year in infested districts. Extensive notes have been made on the biology of several of these parasites, but they are still too incomplete for publication.

The following species have been bred in considerable numbers:—

Year	Hymenoptera	Tachinidae.	Adult Moths	Climatic conditions
1913	*Zele* Sp. 1. Specimen.	*Bonneto comta* 2.5% *Gonia capitata* 39.0%	?	Medium
1914	*Zele* Sp. 2.0% *Met. dimidiatus* 2.0%	*G. capitata* (minimum) 43.0%	5.0%	Drought
1915	*Met. dimidiatus* 2.0% (estimated)	*G. capitata* (min) 7.5% *B. comta* (min) 11.0%	13.0%	Wet
1919	*Met. dimidiatus* 10.0%	No record. *Gonia capitata* about 5.0%	?	Dry
1920	*Met. dimidiatus* 50.0%	Records incomplete	?	Dry

The figures given for Hymenoptera are those obtained by dissection, as are those for Tachinids other than in the years 1914 and 1915. During these years full grown larvae were placed in breeding cages in June and records were kept of the adult moths and parasites that emerged in the fall and following Spring. From the low numbers of cutworms accounted for in these breeding cages,—52% and 33% respectively,—it can be assumed that the actual parasitism was considerably higher than the figures indicate.

Other species bred in small numbers are:—*Peleteria robusta*, Wied. 1913. and *Ernestia radicum* Fab. 1916. Both are Tachinids.

The habits of the more important parasites are briefly as follows:—

Meteorus dimidiatus Cress. (Teste Brues).

Two generations per annum. Hibernate as larvae in overwintering cutworms, such as *Euxoa tristicula* Morr. Adults emerge in May, and parasitize *P. orthogonia* and other Noctuidae. The female lays about twelve eggs in each host. Our records of the date of appearance of the second generation adults indicate a considerable variation from year to year, but the majority have emerged in July.

On account, it is thought, of the underground habits of *P. orthogonia* the percentage of infestation by this Braconid is never as high as it is in the Euxoas, but it is of interest to note that we have bred it from *Sidemia devastator* Brace, a species of cutworm that has never been recorded as coming to the surface.

Gonia capitata DeGeer, and other Species. (Teste Tothill).

At least two closely allied species of Tachinidae, with similar habits, are included here. The only differences that we have been able to detect are slight variations in larval and adult structures. We have found three types of stage 1 larvae. All of the species have one generation per annum. They hibernate as puparia. The adult emerges in May, and lays thousands of minute eggs on vegetation. When eaten by cutworms these eggs hatch and the escaping larvae mature at about the time that the host pupates. They transform into the hibernating puparium either in the soil, or in the dead larva or pupa of their host.

The selection of vegetation by the fly, and the location of the eggs on selected plants, plays an important role in the value of the parasite.

We have found the most abundant oviposition on the blades of Blue-joint (*Agropyron Smithii.*) though it is frequent on other native grasses, and to a slightly less extent on imported graminae, including grain crops. Native dicotyledons may carry a few eggs, but we have never found them on introduced plants belonging to this class.

Unfortunately *P. orthogonia* does not feed readily upon Blue-joint and we did not find that *G. capitata* selected the lower portions of the plants for oviposition in preference to the upper. The high percentage of parasitism is rather remarkable since *P. orthogonia* feeds almost entirely below the ground. It would appear, however, that periods of drought are beneficial to this parasite since the reduced growth of vegetation necessitates a more abundant oviposition on available plants.

Bonneta comta Wied. (Teste Tothill).

Very little is known of the life history of this species. The adult appears in July and August, and it belongs to the group of Tachinidae that are larviparous. It is probably, therefore, double brooded, though it has not been bred from overwintering species of cutworms. Regarding the selection of plants for the supposed larviposition the following figures, obtained in 1915, are of interest.

P. orthogonia larvae collected from Spring Wheat were 21% parasitized

P. orthogonia larvae collected from Fall Wheat were 2% parasitized.

P. orthogonia larvae collected from Alfalfa were 0% parasitized.

This suggests a similar habit to that of *Gonia capitata* in the selection of plants.

With a more complete knowledge of the habits of these parasites, particu-

larly of the Tachinids, it may be possible to encourage their increase by the selection of favorable crops, and a consideration of the most advantageous dates of seeding.

PSITHYRUS LABORIOSUS FABR. IN THE NESTS OF BUMBLEBEES (HYM).

BY THEODORE H. FRISON,
Urbana, Illinois.

Of the nine or possibly ten species of the genus *Psithyrus* occurring in America, North of Mexico, only two have ever been recorded from the nests of bumblebees. When Franklin's work on "The Bombidae of the New World" appeared in 1913, there had not been recorded a single authentic instance of a *Psithyrus* having been taken in a bumblebee's nest in this country. The fact that many American writers had mentioned the inquiline habits of *Psithyrus* was entirely due to the numerous European records on the subject.

Mr. F. W. L. Sladen in the Canadian Entomologist for March, 1915, was the first to record the finding of a species of *Psithyrus* in a *Bremus* (*Bombus*) nest in the Nearctic region. In this article he reports the discovery of *Psithyrus insularis* Sm. in the nest of *Bremus* (*Bombus*) *flavifrons* Cress. on July 7, 1914 at Agassiz, British Columbia. In April, 1916 in the Bulletin of the Brooklyn Entomological Society, the writer recorded the presence of *Psithyrus variabilis* Cress. in the nests of *Bremus pennsylvanicus* DeGeer in the summer of 1910 and 1915 at Champaign, Illinois. Several times since then, both in 1917 and 1920, I have taken *Psithyrus variabilis* Cress. in the nests of *Bremus pennsylvanicus* DeGeer.

On July 22, 1919 I removed to the laboratory for closer study a nest of *Bremus* (*Bombus*) *pennsylvanicus* DeGeer. This nest was one of several started in domiciles I had buried in the ground for attracting searching bumblebee queens. The domicile was first noted as being inhabited on June 20, when it contained a small honey-pot and eggs. As the queen was not in the nest I was unable to determine the species at this time (June 20). On July 22, when I removed the nest, it contained a queen and four small workers of *Bremus pennsylvanicus* DeGeer., besides five egg cells containing eggs, two brood masses, and fifteen pupal cocoons. In the nest material near the entrance were the remains of a queen of *Bremus pennsylvanicus* DeGeer and a queen of *Psithyrus laboriosus* Fabr. The two dead queens were mute testimony of the earlier history of this colony. Evidently after the nest was started another queen of *Bremus pennsylvanicus* DeGeer found it, and a struggle ensued over the possession of the nest. Such fighting over the nests is very common in late spring and early summer. Which queen finally won and stung the other to her death is an open question. The dead *Psithyrus* queen can only be accounted for in much the same manner, and all this goes to show that a *Psithyrus* queen is not always peaceably admitted into a bumblebee nest or victorious in a battle with the *Bremus* queen. The history of this colony was followed until September 16, and no *Psithyrus* were ever reared from the nest.

In a nest of *Bremus* (*Bombias*) *auricomus* Robt., about one and one-half

feet below the surface of the ground, examined on July 26, at Clyman Junction, Wisconsin, I found a queen of *Psithyrus laboriosus* Fabr. In this instance also, the *Psithyrus* queen had evidently been stung by the queen bumblebee. When the *Psithyrus* queen was handled, it was barely able to move a leg, and acted in every respect like a bumblebee that had been stung. It was in the nest material near the entrance of the nest, probably having been dragged there by the *Bremus* queen. In the nest at the time, besides these two queens, were twelve workers, fifteen eggs, and some larvae and pupae. It was impossible to make a detailed study of the development of this colony in order to learn if any individuals of *Psithyrus* were eventually produced.

Whether any of the Nearctic species of *Psithyrus* are restricted to the nests of one particular species of *Bremus* or not is still to be decided. Sladen in the previously mentioned article, infers that *Psithyrus insularis* Sm. must at least frequent the nest of another species of bumblebee besides *Bremus flavifrons* Cress., as *Psithyrus insularis* Sm. occurs at Ottawa, Ontario where *Bremus flavifrons* Cress. is not indigenous. From the evidence given above, *Psithyrus laboriosus* Fabr. evidently invades the nests of both *Bremus pennsylvanicus* DeGeer and *Bremus auricomus* Robt., species representing the two subgenera of *Bremus*. If *Psithyrus laboriosus* Fabr. will enter the nests of two such widely separated species as these, it is reasonable to assume that it will frequent the nest of almost any species of bumblebee within its range. About Urbana, Illinois, where *Psithyrus variabilis* Cress. is very common, I have never found it in the nests of any bumblebee species but *Bremus pennsylvanicus* DeGeer, and it remains for future investigation to decide whether *Psithyrus variabilis* Cress. has more than one host.

Edward Saunders in "The Hymenoptera of the British Islands" says that the species of *Psithyrus* appear not always to confine themselves to the same host. Hoffer, one of the closest students of the European *Bremidae,* reports finding *Psithyrus campestris* Panz. in the nests of *Bremus agrorum* Fabr., *B. silvarum* Linn., and *B. variabilis* Schmied. *Psithyrus rupestris* Fabr. and *P. vestalis* Fouc., however, are apparently very closely associated with *Bremus lapidarius* Linn. and *B. terrestris* Linn. Even these last two species of *Psithyrus,* as shown by Sladen in "The Humble-bee" occasionally lodge in a nest of another species of bumblebee.

NOTES ON THE PREPARATORY STAGES OF GNOPHAELA VERMICULATA G. AND R.

BY F. C. WHITEHOUSE.
Red Deer, Alta.

Mid-June 1919 I took some nearly full grown larvae of this species in a tamarack swamp near Red Deer, which pupated about a week later and emerged 11th to 14th July. The larvae were feeding on the borage *Mertensia virginica*. I wrote Dr. McDunnough inquiring if the life history were known, and received reply that the full grown larvae had been twice described in Entomologica Americana IV, 24 and V. 57 but that he had no knowledge of any published notes on the egg or early larval stages. He was kind enough to send me copies of the descriptions referred to.

On 31 July I received from Mrs. W. A. Cassels from Sylvan Lake, Alberta, a female moth and eggs.

Egg—The eggs, 19 in number were laid in rows close together but not touching. In shape round, except at the flattened base. Diameter approximately 1mm. Surface smooth, infinitesimally pitted. Colour rich yellow. Period of incubation (from eggs obtained later) ten days.

6th August, 9 pm: the eggs less yellow, with the black heads of the embryo larvae clearly defined at top: movement of heads noticeable, and also opening and closing of mandibles and protrusion and contraction of mouth-parts. Eggs circumscribed with two or three strands of long black hairs.

7th August 4.30 pm: three larvae hatched, the number by 9 pm. being increased to ten, by 10 p.m. to thirteen, and the balance by morning. Exit obtained by larva eating the shell immediately above head to requisite size for body to pass through. The newly emerged twist and stretch themselves, and take a short respite, after which they make their first meal under new conditions on the empty egg shells, feeding indiscriminately, two or three often at work on the same shell, and even in some instances, endeavouring to get at the broken edge of an egg through which another was hatching.

Larva Stage 1. Length about 2mm. Head black approximately the same width as the body. Colour of body, including tubercles and legs, entirely yellow Tubercles prominent; setae black, very long—say two to three times diameter of body.

Two or three hours after hatching the ground colour of body has become dirty yellow, and the tubercles, shield on first thoracic segment, and legs, glossy black—the change first noticeable on thoracic shield and fore legs. The tubercles on the abdominal segments 1-8, dorsal view, are situated as follows—a pair anteriorly, and a pair widely separated posteriorly—the four forming a crescent. There are also three or four tubercles on the sides of each segment. Thoracic segments 2 and 3 and abdominal segment 9, dorsal view, have double or twin tubercles widely separated in place of the two pairs of the other segments as above described. The twin tubercles have two hairs, and the oblong shield on thoracic segment 1, four short setae.

8th August. By the evening larvae commenced feeding on the upper and lower surfaces of the leaves of the food plant, leaving the tissue.

10th August. Length 5 mm. A double row of light brown blotches each side of the dorsum and another low down on the sides; the ground colour of the dorsum and sides is now greenish yellow.

14th August. Larvae off their feed all day and by the evening of 15th all have moulted. Length 6-7 m. Appearance radically changed: tubercles larger and bristling with short glossy black setae in place of long single or double hairs of prior stages. Ground colour of dorsum and sides yellow, irregular brown blotches connecting tubercles on either side of dorsum. Head brown.

22nd August. Length 8-9 m. The irregular brown blotches have darkened and extended on the sides—the yellow being less discernible. The yellow dorsal stripe remains, posteriorly broad enough to include the pair of tubercles referred to previously, and again widening at the base of each segment.

27th August. Second moult occurred. Length 9m. Sides mottled brown and yellow: dorsum yellow. Tubercles, from being black, have taken on the metallic-blue luster of the final larval stage; the head, likewise, has assumed the bright chestnut red of the full grown larva; in fact the general appearance is now that of the mature larva prior to pupation.

Absent from home 30th August to 23rd September, and no material change noticeable on my return. Found several larval skins and assume that at least one further moult had taken place. Length still 9m.

29th Sept.—2nd Oct, Another moult.

3rd—11 Oct. Weather cold, snow, and as much as 22 degrees of frost. The leaves of the food plant decayed and turned brown, both in the feeding bottle and in nature. Clearly hibernation must now occur.

12th Oct. Fourteen of the larvae still alive; went to earth.

My material did not re-appear in the Spring, so the satisfaction of rearing the species from egg to moth was not realized. My memoranda would however serve to show that there are at least four moults prior to hibernation; that after the second moult the general appearance is very much that of the full grown larvae, and that the pre-hibernation growth is remarkably slow and retarded—though there is the possibility of this being attributable to captivity to some degree.

I realize that, from the specialist's point of view, the above account leaves much to be desired as to specificness (and probably accuracy) of detail. It is only supposed to be the story of the early stages of the insect as seen by a collector.

A SYNOPSIS OF THE NORTH AMERICAN SPECIES OF THE GENUS HELINA R.-D., SENS. LAT. (DIPTERA, ANTHOMYIIDAE).

BY J. R. MALLOCH,
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The forty species included in the present synopsis belong to several closely allied genera, *Helina, Hebecnema, Spilaria, Xenomydaea*, and *Enoplopteryx*. All of the species would fall within the limits of Stein's genus *Mydaea* but they are undoubtedly a conglomerate group and it is in my opinion necessary to separate the component parts at least as subgenera though I incline to the opinion that they are really entitled to full generic rank. The distinguishing characters of the groups are dealt with in several of my recently published papers on the family and will be summarised in a generic synopsis which is now in manuscript.

Key to Species.

MALES.

1. Hypopleura with fine erect hairs usually in a more or less vertical series below middle of spiracle or near posterior margin; eyes with long hairs; prealar bristle short but distinct; scutellum with the setulose hairs continued downward on lateral margins and at times slightly invading ventral surface; basal abdominal sternite with a few hairs.... (*Spilaria*) 2.

— Hypopleura with a few long hairs on upper margin in front of spiracle; sides and ventral surface of scutellum bare; first abdominal sternite

bare.....(Gen. n.) *marmorata* Meigen?

— Hypopleura bare; if with a few hairs below spiracle the sides and ventral surface of scutellum are bare; first abdominal sternite sometimes with a few hairs.....4

2. Hind femur with a few bristly hairs at apex on posteroventral surface, none of which are nearly as long as the diameter of femur where they are situated; eyes densely long haired, separated by a little more than width of anterior ocellus.....*multisetosa* Schnabl

— Hind femur with a number of bristles at apex on posteroventral surface, most of which are distinctly longer than diameter of femur where they are situated.....3.

3. Eyes densely long haired, separated by a little more than width of anterior ocellus; black species, more or less densely gray pruinescent, but the dorsum of thorax always shining.....*lucorum* Fallen

— Eyes rather sparsely haired, separated by distinctly more than the width across posterior ocelli; black species, the entire body densely gray pruinescent, the dorsum of thorax not distinctly shining.....*punctata* Stein

4. Legs entirely black.....5

— Legs partly yellowish or reddish.....13

5. Eyes separated by nearly one third of the head-width; mid tibia with two very strong anterodorsal bristles; hind tibia with one or two bristles near base on posterodorsal surface; first abdominal sternite setulose.....*latifrontata* Malloch

— Eyes separated by much less than one third of the head-width; mid tibia without anterodorsal bristles except in *nitida* and *nigrita*.....6.

6. Knobs of halteres black.....7.

— Knobs of halteres pale.....9.

7. Margins of calyptrae black; eyes with short hairs; arista with its longest hairs as long as width of third antennal segment; posteroventral surface of hind femur without strong bristles; basal abdominal sternite setulose.....*nitida* Stein

— Calyptrae yellowish, margins pale; eyes bare.....8.

8. Posteroventral surface of hind femur with a series of strong bristles; longest hairs on arista not longer than its basal diameter; basal abdominal sternite bare; prealar bristle moderately long.....*hannai* sp. n

— Posteroventral surface of hind femur almost bare; longest hairs on arista longer than width of third antennal segment; prealar bristle absent or minute; basal abdominal sternite bare....*Hebecnema vespertina* Fallen

9. Mid tibia with a small protuberance on posterior side beyond middle, which is covered with short setulae, and basad of the protuberance about ten long bristles on the same surface.....*tuberculata* Malloch

— Mid tibia without such protuberance and bristles.....9a.

9a. Hind femur with a series of long bristles from base to apex on anteroventral surface, the length of the bristles exceeding the diameter of femur; a few weak hairs sometimes below metathoracic spiracle; basal abdominal sternite setulose.....*nasoni* Malloch

— Hind femur with long bristles confined to apical half of anteroventral surface; basal abdominal sternite bare....10.
10. Abdomen with a black dorsocentral vitta; eyes short haired, almost contiguous....*Hebecnema umbratica* Meigen.
— Abdomen with paired black dorsal spots; eyes not nearly contiguous....11.
11. Thorax with three pairs of postsutural dorsocentral bristles; hind femur with antero-and posteroventral bristles; mid tibia with two weak anterodorsal bristles....*nigrite* Malloch
— Thorax with four pairs of postsutural dorsocentral bristles; posteroventral surface of hind femur and anterodorsal surface of mid tibia without bristles....12.
12. Abdomen inconspicuously spotted; wings very conspicuously browned towards base and anteriorly; hind tibia without a bristle near base on posterodorsal surface; eyes separated by less than width across posterior ocelli....*nigricans* Stein
— Abdomen conspicuously spotted; wings hyaline; hind tibia with a setula near base on posterodorsal surface; eyes separated by at least as great a distance as width across posterior ocelli....*duplicata* Meigen
13. Thorax with four pairs of postsutural dorsocentral bristles....14.
— Thorax with three pairs of postsutural dorsocentral bristles....24.
14. Femora partly or entirely black....15.
— Femora entirely pale....22.
15. Eyes with dense long hairs; abdomen ovate, with dorsal paired spots and lateral checkerings....16.
— Eyes bare or with very short sparse hairs; abdomen not as above....19.
16. Hind femur without bristles on posteroventral surface; hind tibia with long bristles on entire length of anteroventral and posterior surfaces....*pectinata* Johannsen
— Hind femur with long slender bristles on basal half of posteroventral surface; hind tibia not as above....17.
17. Thorax with one pair of long presutural acrostichal bristles; lateral margins and ventral surface of scutellum bare....*orbitaseta* Stein
— Thorax without long presutural acrostichal bristles....18.
18. Eyes separated by about the width of anterior ocellus; ventral surface of scutellum bare....*rufitibia* Stein.
— Eyes separated by at least the width across posterior ocelli; ventral surface of scutellum with sparse erect soft hairs....*brevis* Stein
19. Abdomen with a distinct black dorsocentral vitta; eyes sparsely haired, almost contiguous above; hind femur without bristles on posteroventral surface except near apex....*Hebecnema vespertina* Fallen
— Abdomen with distinct paired spots on dorsum....20.
20. Third wing-vein bristly at base; hind tibia with a very long anterodorsal median bristle, the apical dorsal one very weak....*Enoplopteryx anceps* Zetterstedt*
— Third wing-vein bare at base; apical dorsal bristle on hind tibia strong, nearly or quite as long as the median anterodorsal one....21

*Recorded by Stein but probably erroneously.

21. Prealar bristle present but small; hind femur bare at middle on posteroventral surface; mid tibia without anterodorsal or posteroventral bristles; fifth sternite without strong bristles..... *duplicata* Meigen

— Prealar bristle absent or minute; hind femur with one or two strong, but not very long bristles at middle of posteroventral surface; mid tibia with one or two anterodorsal and posteroventral bristles; fifth abdominal sternite with a very strong bristle on each side of cleft..... *bispinosa* Malloch

22. Thorax shining fulvous, without conspicuous pruinescence; facets on upper half of eyes very conspicuously enlarged, the head flattened above; arista plumose..... *Hebecnema fulva* (Bigot)

— Thorax if fulvous with distinct pruinescence; facets of eyes but little enlarged above, the head not flattened; arista very short haired.....23.

23. Hind tibia with two or more anterodorsal bristles; hind femur with eight to ten bristles extending from middle to apex on anteroventral surface, the longest bristles distinctly longer than the diameter of femur..... *lysinoe* Walker

— Hind tibia with one anterodorsal bristle; hind femur with three or four short bristles at apex on anteroventral surface, none of which exceed in length the diameter of femur..... *uniseta* Stein.

24. Scutellum with a conspicuous black spot on each side at base..... *uliginosa* Fallen

— Scutellum without such spots.....25.

25. Abdomen with an indistinct black dorsocentral vitta; mid tibia with one or two anterodorsal bristles; fore tibia with two posterior bristles; basal abdominal sternite setulose..... *linearis* Malloch

— Abdomen with paired spots on dorsum which are sometimes indistinct; mid tibia almost invariably without anterodorsal bristles.....26.

26. Eyes separated by one third of the head-width; only the fore femora blackened; spots on dorsum of abdomen very indistinct ..... *spinilamellata* Malloch

— Eyes separated by much less than one third of the head-width, or not otherwise as above.....27.

27. Posteroventral surface of hind femur with long hairlike bristles on almost its entire length or on basal half; posterodorsal surface of hind tibia with from one to three short setulae.....28.

— Posteroventral surface of hind femur bare or with a few bristles at middle or near apex; posterodorsal surface of hind tibia without setulae except in *abiens* and *spuria*.....30.

28. Hind tibia with long soft hairs on ventral surfaces.... *consimilata* Malloch

— Hind tibia with a few small bristles on anteroventral and posteroventral surfaces, the ventral surface bare.....29.

29. Eyes separated by three times the width across posterior ocelli; legs black ..... *fletcheri* Malloch

— Eyes separated by less than twice the width across posterior ocelli; tibiae and apices of femora reddish yellow..... *nigribasis* Malloch.

30. Hind tibiae with rather dense long bristly hairs on ventral surfaces....30a.
— Hind tibia without dense bristly hairs on ventral surfaces.....30b.
30a. Hind femur with some long bristly hairs on apical half of posteroventral surface; cross-veins indistinctly infuscated.....*oregonensis* Malloch
— Hind femur without long bristly hairs on posteroventral surface; cross-veins very conspicuously infuscated.....*cothurnata* Rondani.
30b. Only the fore femora blackened; palpi yellow; prealar bristle absent; cross-veins not infuscated; hind femur bare at middle on posteroventral surface.....*abiens* Stein
— All femora more or less blackened; palpi largely or entirely black; prealar bristle distinct except in *spuria*.....31.
31. Cross-veins of wings very conspicuously infuscated; hind femur bare at middle on posteroventral surface; third vein bare at base; basal abdominal sternite setulose.....*obscurinervis* Stein
— Cross-veins of wings very narrowly infuscated; hind femur with a few short bristles on middle of posteroventral surface; third wing-vein at base and basal abdominal sternite bare.....*spuria* Malloch
— Cross-veins of wings not infuscated; hind femur with two or three short bristles at middle of posteroventral surface; third vein with a few weak setulae at base above and below; basal abdominal sternite bare.....*Xenomydaea buccata* Malloch

FEMALES.

1. Hypopleura with some fine hairs below spiracle.....2.
— Hypopleura with some hairs on its upper margin in front of spiracle.....*marmorata* Meigen?
— Hypopleura bare.....5.
2. Hind tibia with three anterodorsal bristles; wing-veins 3 and 4 very decidedly divergent at apices.....*multisetosa* Schnabl
— Hind tibia with two anterodorsal bristles; veins 3 and 4 very little divergent at apices.....3.
3. Thoracic and abdominal pruinescence brownish gray; calyptrae yellowish.....*lucorum* Fallen
white.....*punctata* Stein
— Thoracic and abdominal pruinescence whitish gray; calyptrae
4. Legs entirely black, rarely with the knees reddish.....6.
— Legs with at least the tibiae of one or more pairs reddish or yellowish....
5. Mid tibia with one or more anterodorsal bristles; hind tibia with one or two posterodorsal setulae near base.....7.
— Mid tibia without anterodorsal bristles; or the hind tibia has no posterodorsal setulae near base and the arista is nearly bare.....9.
6. Ventral surface of scutellum with soft erect hairs....*hylemyioides* Malloch
— Ventral surface of scutellum bare.....7.
7. Halteres blackish brown.....*nitida* Stein.
— Halteres pale yellow.....*latifrontata* Malloch
8. Halteres black.....9.
— Halteres pale.....10

9. Arista pubescent; calyptrae with black margins....*fuscomarginata* Malloch
— Arista plumose; calyptrae entirely pale.... *Hebecnema vespertina* Fallen
10. Arista plumose; prealar bristle absent or minute; mid tibia without anterodorsal bristles.....*Hebecnema umbratica* Meigen
— Arista pubescent; prealar bristle more than half as long as the one behind it; mid tibia with one or two anterodorsal bristles..*tuberculata* Malloch
11. Thorax with four pairs of postsutural dorsocentral bristles.....12.
— Thorax with three pairs of postsutural dorsocentral bristles
12. Ventral surface of scutellum with some soft erect hairs at apex; mid tibia with several anterodorsal bristles.....*brevis* Stein
— Ventral surface of scutellum bare.....13.
13. Mid tibia with an anterodorsal bristle; mid and hind femora in part blackened.....*duplicata* Meigen
— Mid tibia without an anterodorsal bristle; mid and hind femora not blackened .....14.
14. Thorax with a very strong pair of presutural acrostichals..*orbitaseta* Stein
— Thorax without a strong pair of presutural acrostichals....*rufitibia* Stein
15. Abdomen checkered, without distinct paired dorsal spots; palpi black....16.
— Abdomen with paired dorsal black or brown spots, if the spots are indistinct the ground colour of the abdomen and sometimes of the thorax is more or less testaceous and the palpi are entirely or largely yellow.....17.
16. Antennae entirely black.....*mimetica* Malloch
— Third antennal segment conspicuously reddish yellow at base.....*johnsoni* Malloch
17. Longest hairs on arista about as long as width of third antennal segment.....*Hebecnema fulva* Bigot
— Arista much shorter haired.....18.
18. Hind tibia with one anterodorsal bristle; abdomen black, densely gray pruinescent, with black paired dorsal spots; palpi broadly infuscated at apices.....*uniseta* Stein
— Hind tibia with two anterodorsal bristles; abdomen more or less testaceous, gray pruinescent, with poorly defined brown paired spots on dorsum; palpi entirely yellow.....*lysinoe* Walker
19. Scutellum with a conspicuous black spot on each side at base.....*uliginosa* Fallen
— Scutellum without such spots.....20.
20. Third wing-vein with a few weak setulae at base above and below.....*Xenomydaea buccata* Malloch
— Third wing-vein bare at base.....21.
21. Wings with the cross-veins very conspicuously infuscated; hind tibia without posterodorsal setulae near base.....22.
— Wings with the cross-veins not or but slightly infuscated, or the hind tibia has one or more posterodorsal setulae near base.....24.
22. Thorax entirely yellowish testaceous; head and abdomen fuscous; arista with its longest hairs distinctly shorter than width of third antennal segment.....*bicolorata* Malloch

— Thorax largely or entirely blackish.....23.

23. Arista with its longest hairs about equal in length to width of third antennal segment; hind femur with one or two long bristles at middle on posteroventral surface.....*obscurinervis* Stein

— Arista with its longest hairs about as long as its basal diameter; hind femur without bristles at middle on posteroventral surface.....*neopoeciloptera* Malloch

24. Hind tibia with one setula near base on posterodorsal surface.....sp.

— Hind tibia with three or four setulae on posterodorsal surface.....25.

25. Only the fore femora infuscated; antennae with second segment and base of third ferruginous; longest hairs on arista longer than width of third antennal segment; fore tibia with one posterior bristle; mid tibia without an anterodorsal bristle.....*abiens* Stein

— Mid and hind femora as well as fore pair infuscated at bases; antennae entirely black; longest hairs on arista a little shorter than width of third antennal segment; fore tibia with one anterodorsal and usually two posterior bristles; mid tibia with an anterodorsal bristle.....*nigribasis* Malloch

— Only the fore femora infuscated; antennae with second segment reddish; longest hairs on arista distinctly shorter than width of third antennal segment.....*spuria* Malloch

Helina hannai sp. n.

Male and Female.—Black, almost glossy. Orbits and cheeks with white pruinescence, frontal stripe opaque black; antennae and palpi black. Thorax indistinctly trivittate. Abdomen with brownish gray pruinescence, and a continuous dorsocentral black vitta. Legs black. Wings slightly fuscous, bases of veins yellow. Calyptrae bright yellow. Knobs of halteres black.

Eyes of male separated by about one tenth of the head-width; arista very pubescent; eyes almost bare. Thorax with 4 pairs of postsutural dorsocentral bristles; prealar bristle long. Abdomen subcylindrical, slightly tapered at apex; hypopygium small. Fore tibia with two or three setulae on posteroventral surface; mid tibia with two posterior bristles; hind tibia with two anterodorsal and two anteroventral bristles; hind femur with a continuous series of long bristles on anteroventral surface and some on basal half of posteroventral.

Female.—Frons over one third of the head-width; arista pubescent as in male.

Length, 6.5—7.5 mm.

Type.—St. George Island, Behring Straits, June 24, 1914. Allotype and two paratypes, same data as type; one male paratype and puparium, same locality, June 20, 1913; one male, June 10, 1914; one male and two females, June 17, 1914 (G. D. Hanna).

Named in honor of the collector.

Type in collection of United States Bureau of Biological Survey.

A FURTHER COMPARISON OF THE WINGS OF ZORAPTERA, PSOCIDS, AND APHIDS, FROM THE STANDPOINT OF PHYLOGENY.

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The venation of the fore wings of the Zoraptera, Psocids, Aphids, and related forms was discussed in a recent paper published in Vol. 32, p. 97, of the Entomological News for 1921; but the venation of the hind wings of these insects was not included in the paper referred to above, since material suitable for determining the homologies of the peculiar venation of the hind wings of the Zoraptera was not available at that time. Recently, however, through the kindness of Mr. Nathan Banks, I have been able to study the venation of the aberrant psocids figured by Enderlein 1903-1906, which have enabled me readily to homologize the veins of the hind wing of Zoraptera; and since Enderlein's principal paper was published in a Hungarian periodical which is doubtless inaccessible to many cisatlantic entomologists, I have included in the present paper such of Enderlein's figures as are of value for determining the homologies of the veins of both wings in the Zoraptera, and for determining the closest affinities of these insects. For the privilege of studying the wings of the intensely interesting and phylogenetically important order Zoraptera, I am indebted to the kindness of Mr. A. N. Caudell whose sympathetic interest, and unfailing readiness to lend assistance, has been a source of inspiration and encouragement to many a student in the field of entomological research.

The affinities of the Zoraptera have been discussed by Silvestri, 1913, Caudell, 1920, and Crampton, 1920, and all of these investigators were apparently impressed by the resemblance of the Zoraptera to the Isoptera in their general appearance, their colonial habits, the breaking off of the wings, and in certain details of thoracic and abdominal structures. I have emphasized the fact, however, that the Zoraptera are strikingly like the ancestors of the Psocids, and in an article published in Vol. 32, p. 97, of the Ent. News I have grouped the Zoraptera, Psocids, Mallophaga, Anopleura, Thysanoptera, Palaeohemiptera, Homoptera and Hemiptera, etc., in a common super-order, the "Panhomoptera" (instead of grouping the Zoraptera with the Isoptera, as in former papers) and likewise called attention to the fact that "the resemblance of both fore and hind wings of the Psocid *Archipsocus textor* to the wings of the Zoraptera is strikingly close." In the present paper, I would present the evidence of the wing veins supporting the contention that the Zoraptera are nearer to the Psocids than to any other insects; and that the Zoraptera should therefore be placed in the super-order Panhomoptera next to the Psocid members of this group; and I would also call attention to the fact that the wings of the Zoraptera are very suggestive of those of the Hymenoptera in certain respects—a resemblance which likewise extends to certain of the body structures as well.

So far as the wings are concerned, the resemblance between the Zoraptera and the Psocids is so marked, that they might readily be grouped in the same order, if the wings were the only features to be considered, since the wing venation of the Psocid sub-family Archipsocinae is even more like that of the Zorap-

tera than it is like that of many other insects grouped with them in the order Psocida, and the range of variation in the wing venation of members of this order covers far greater differences of venation than that between the Psocid group Archipsocinae and the Zoraptera. The genitalia of the Zoraptera, however, are quite different from the genitalia of the Psocids, the Zoraptera have well developed cerci, which are absent in all Psocids of which I have any knowledge, the head is of a more primitive type (and the mouthparts also) in the Zoraptera, as is also true of the thoracic sclerites of the sternal and pleural regions, and many other features, which would preclude our placing the Zoraptera in the same order with the Psocids, although the relationship between the two groups is far closer than has hitherto been supposed to be the case.

The fore wing of *Archipsocus brasilianus* shown in Fig. 10, Plate III, is strikingly similar to that of *Zorotypus snyderi* shown in Fig. 12, since in both insects, the cubitus is two-branched (i.e. it divides into "Cu_1" and "Cu_2"), while the median vein "M", is unbranched and bends upward toward "R_S" very abruptly, forming a slight connection with the latter, before bending down again toward the posterior margin of the wing. Vein "R_S" is very similar in both insects, and a comparison of Fig. 12 with Fig. 10 would indicate that in *Zorotypus snyderi* (Fig. 12) vein "R_{4+5}" has become lost, while only the branch "R_{2+3}" of the two branches of "R_S" present in Fig. 10, persists to form the terminal portion of the vein labeled "R_S" in Fig. 12 i.e. the portion labeled "R_{2+3}" in Fig 12). The pterostigma "ps" is very similar in both insects, and the fore wings of *Zorotypus snyderi* and *Archipsocus brasilianus* exhibit so many tendencies in common in their modifications, that one cannot escape the conclusion that the two insects are extremely closely related.

In Archipsocus brasilianus (Fig. 10) as in *Zorotypus snyderi* (Fig. 12) vein "M" of the fore wing is barely connected with "R_S"; but in *Archipsocus recens* (Fig. 9) vein "M" of the fore wing has coalesced with vein "R_S" for a considerable distance to form "R_S+M", and the same is true of the fore wing of *Zorotypus hubbardi* shown in Fig. 11. We thus have the modificational tendencies exhibited by the fore wing of *Archipsocus brasilianus* repeated in the Zorapteron *Zorotypus snyderi*, while the modificational tendencies exhibited by the fore wing of *Archipsocus recens* are repeated in the Zorapteron *Zorotypus hubbardi;* and anyone who will compare the fore wings in the two groups of insects must be impressed with the remarkable similarity between the two types of wings.

The resemblance between the hind wings of the Zoraptera and Psocids is no less remarkable than the resemblances exhibited by the fore wings in the two groups of insects. Thus, in the hind wing of *Zorotypus snyderi* shown in Fig. 3 (which is almost exactly like that of *Zorotypus hubbardi*), vein "R_{4+5}" is almost an exact counterpart of vein "R_{4+5}" in Fig. 5 of the hind wing of *Archipsocus recens,* as is also true of vein "M_2" in both insects. Vein "R_S" has united with "M" and with "M + Cu" for a greater distance in the insect shown in Fig. 3 than in the insect shown in Fig. 5, and the small cell just below the label "R_S" in Fig. 5, has become obliterated in Fig. 3; but the cubitus "Cu_2" is much the same in the two insects,although the anal lobe "al" of Fig. 5, is not represented

in Fig. 3, nor is vein "R_1" of Fig. 5 represented in Fig. 3. The differences between the two types of wings are very slight, when one takes into consideration the fact that they belong to insects grouped in separate orders, and the wing of the Zorapteron shown in Fig. 3, is actually more like the Psocid shown in Fig. 5, than this Psocid is like many other members of its own order of insects (the Psocida), as one may readily see by comparing it with *Cymatopsocus opalinus* and similar Psocids. At any rate, it is a comparatively simple matter to homologize the veins of the Zorapteron wing shown in Fig. 3, with the veins of the Psocid wing shown in Fig. 5, and by working back to the intermediate type of venation exhibited by the wing shown in Fig. 6, we have a connecting link passing over into the more typical venation of the order.

Veins "R_{2+3}" and "R_{4+5}" are distinct in the wing of *Psyllipsocus ramburi* shown in Fig. 6; but in the hind wing of an aberrant form of this species, figured by Enderlein, 1903, these two veins have united almost completely (they are separate only near the margin of the wing, and for a very short distance) which suggests that the vein labeled "R_{2+3}" in Fig. 5, represents the fusion product of veins "R_{2+3}" and "R_{4+5}" of Fig. 6. Similarly, the vein labeled "M_2" in Fig. 5, probably represents the fusion product of veins "M_1" and "M_2" of Fig. 6, and the same holds true for the venation of the wing shown in Fig. 3, which is homologous with the venation of the wing shown in Fig. 5. The discal cell below the label "R_5" in Fig. 5 is represented by a similar cell below the letter "R" in Fig. 6 (this cell has become obliterated in Fig. 3); but the longitudinal vein "R_4" of Fig. 5 has assumed a more vertical position in Fig. 6, in which the vein labeled "R_3" may represent only a portion of vein "R_3" of Fig. 5, or the latter vein may have coalesced with the veins behind it, save for its terminal portion which remains free to form the vein labeled "R_3" in Fig. 6. The Vein "Cu_2" of Fig. 5, is evidently the homologue of the vein labeled "Cu_2" in Fig. 6, and it is quite impossible that vein "Cu_1" has united with "Cu_2" to form the single vein labeled "Cu_2" in both figures, although there is not positive evidence available to determine this point; and it is also quite possible that the vein labeled "Cu_2" represents only the second branch of cubitus, the first branch (i.e. "Cu_1") having faded out, or become lost in some such fashion. When a wider series and more intermediate forms of Psocids have been studied, these points may be determined with more certainty, although an examination of the tracheation of the insects in question would likewise throw much light upon the matter, if one could procure fresh material for study. These points, however, are of minor importance, and so far as the principal longitudinal veins are concerned, it is a comparatively simple matter to determine their homologies in the Zoraptera and Psocids, the only matter of uncertainty being to determine which of the branches of these longitudinal veins are lost, or unite with other branches to form the terminal portions of the longitudinal veins.

The hind wing of the Aphid shown in Fig. 1 is rather suggestive of the hind wing of the Zoraptera (Fig. 3) in its venation. The vein "Cu_2" of Fig. 1, however, is situated further (distally) from the base of the wing and is proportionately much longer than vein "Cu_2" of Fig. 3, and vein "R_5" is bent abruptly forward in Fig. 3 while it extends more nearly in a straight line with the basal

portion of the vein in Fig. 1. The fore wing of an Aphid (Fig. 7) however, is more like that of a Psocid (Fig. 8) than that of a Zorapteron (Fig. 11), and the nature of the veins A., and "Cu$_2$" of Fig. 8 is very suggestive of the condition exhibited by these veins in Fig. 7. The incomplete vein "R_s" of Fig. 8 is also very suggestive of vein "R_s" of Fig. 7; but the point of origin and the extent of vein "M" of Fig. 8, is somewhat different from that of the vein bearing the same label in Fig.7. On the whole, however, the resemblance between the types of wings shown in Figs. 7 and 8 is very striking, and adds further weight to the evidence drawn from other sources indicating that the Psocids represent as nearly as any living forms, the ancestral types from which the Aphids and other Homopterous insects were derived.

The venation of the fore wing of the Psocid shown in Fig. 2 approaches remarkably closely the type of venation occurring in the Thysanoptera;* and since it furnishes us with the basis for determining the homologies of the Thysanopteron venation, it is of considerable importance to make as accurate a determination of the venation of the Psocid in question as it is possible to do from the evidence at hand. A comparison of *Embidotroctes* (Fig. 2) with *Embidopsocus* (Fig. 4) which is slightly less modified than the former insect, would indicate that branch "R_{4+5}" is either lost, or coalesces with "R_{4+5}" (Fig. 4) to form the terminal portion of the vein labeled "R " in Fig. 2. I am more inclined to consider that vein "R_{2+3}" of Fig. 4 is lost, in Fig. 2 ; and hence the terminal portion of vein "R_s" of Fig. 2 would be formed by "R_{4+5}" alone. The reason for so thinking is that in the fossil Thysanopteron *Palaeothrips fossilis*, the terminal portion of a similar vein appears to be formed by "R_{4+5}", while vein "R_{2+3}" becomes vertical, and takes on the appearance of a cross vein connecting it with the anterior margin of the wing. This matter, however, will be discussed more at length in a subsequent paper, and need not be further considered here. It may be remarked in passing that the terminal portion of vein "M" of Figs. 2 and 4, is probably composed of "M_3", as is indicated by the labelling.

The principal points brought out in the preceeding discussion may be briefly summarized as follows. The Psocids are much nearer the Zoraptera than has formerly been supposed to be the case, and so far as the wing veins are concerned, the Psocid family Caeciliidae approaches the Zoraptera much more closely than any other known insects, the wings of the Psocid *Archipsocus brasilianus* (Fig. 10) being remarkably like those of the Zorapteron *Zorotypus snyderi* (Fig. 12) while the wings of the Psocid *Archipsocus recens* (Fig. 9) are remarkably like those of the Zorapteron *Zorotypus hubbardi* (Fig. 11). In both groups of insects there is a tendency to form a pterostigma "ps", and there is also a tendency toward the formation of a thickening of the margin of the wing to form a sort of "ambient" vein like that found in the Thysanoptera. In both Zorapteron and Cæciliid fore wings, the vein "$R_{2\perp3}$" tends to curve forward toward the anterior margin of the wing, and vein "M" is unbranched, and tends to bend backward toward the posterior margin of the wing. Vein "Cu" is two branch-

* The veins labeled "M" and "Cu," in Fig. 3 of the fossil Thysanopteron described in Ent. News Vol. 32, p. 97, should be labeled "M_1" and "M_2", judging from the evidence furnished by a study of the wings discussed in the present paper.

ed in both groups, in the fore wing, and is unbranched in the hind wing. The course of veins "R_{2+3}" and "M_2" is astonishing similar in the hind wings of both types of insects.

While it has no direct bearing on the matter of indicating a close relationship between the two groups, it may be mentioned that in the Psocids there is a marked tendency toward the development of aberrations in the venation of certain individuals, and the venation of the wing of one side of the body may even differ from that of its fellow on the other side of the body. Similarly in the Zoraptera, there is also exhibited a marked tendency toward a variation in the venation of certain individuals, and in a specimen of *Zorotypus snyderi* which I have examined, the venation of the right fore wing was quite different from that of the left fore wing, thus suggesting the operation of similar tendencies in the two groups of insects.

The evidence of the wing venation would add further support to the indications of an extremely close relationship between Zoraptera and Psocids furnished by other features of the body, and this relationship is so intimate that it is quite evident that the Zoraptera should be placed in the superorder Panhomoptera next to the Psocids. Furthermore, the Zoraptera are the nearest living representatives of the types ancestral to the Psocids, and these in turn are very like the ancestors of the Thysanoptera, Mallophaga, Anopleura, Hemiptera and Homoptera.

The orders of winged insects may be grouped into the following superorders, according to the revised views expressed in an article recently published in Psyche, Vol. 27, 1920, p. 125, which are further modified to a slight extent, in the following list.

Palaeodictyopteriod Superorder (Panpalaeodictyoptera or Ephemeriformia).... Protephemeroida, Ephemeroida, Protodonata, Odonata, Palaeodictyoptera, "Protohemiptera" etc.

Plecopteroid Superorder (Panplecoptera or Perliformia)..... Haplopteroida, Plecoptera, Hadentomoida, Embioida, Dermaptera, etc.

Orthopteroid Superorder (Panorthoptera or Phasmiformia)..... Protorthoptera, Grylloblattoida, Phasmoida, Orthoptera, etc.

Isopteroid Superorder (Panisoptera or Blattiformia)..... Protoblattoida, Blattoida, Mantoida, Isoptera, etc.

Psocoid Superorder (Panhomoptera or Psociformia)..... Zoraptera, Psocoida, Mallophaga, Pediculoida, Thysanoptera, Homoptera, Hemiptera, Palaeohemiptera, etc.

Neuropteroid Superorder (Panneuroptera or Sialiformia)..... Neuroptera, Hymenoptera, Mecoptera, Protomecoptera, Paramecoptera, Paratrichoptera, Trichoptera, Lepidoptera, Diptera, Siphonaptera, etc. The Coleoptera and Strepsiptera may eventually be placed in this superorder, but I have not been able to definitely decide concerning them or such forms as the Megasecoptera, etc., which are also related to members of this superorder.

The Plecopteroid superorder appears to lead to the Neuropteroid superorder, while the Isopteroid superorder appears to lead to the Psocoid superorder,

in some respects. The Orthopteroid superorder is somewhat intermediate between the Isopteroid superorder and the Plecopteroid superorder with its closest affinities very slightly nearer the former, though the balance between the Isopteroid and Plecopteroid characters in the Orthopteroid group is fairly evenly divided. The Isopteroid and Plecopteroid superorders are both very close to the Palaeodictyopteroid group, which may represent the common ancestors of both.

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Abbreviations.

The numerals written to the right and below the letters indicate branches of the veins referred to. A plus sign between letters indicates a coalescence of the veins in question.

al....Anolobus or anal lobe (vestigial anoflabellum, or anal fan of lower insects).

A....First anal vein.

ap...Anoplica, or anal fold.

as...Anosinus, or anal sinus.

ax...Axillary vein (second anal).

ch...Costahamus, or costal hook.

Cu ..Cubitus.

M...Media.

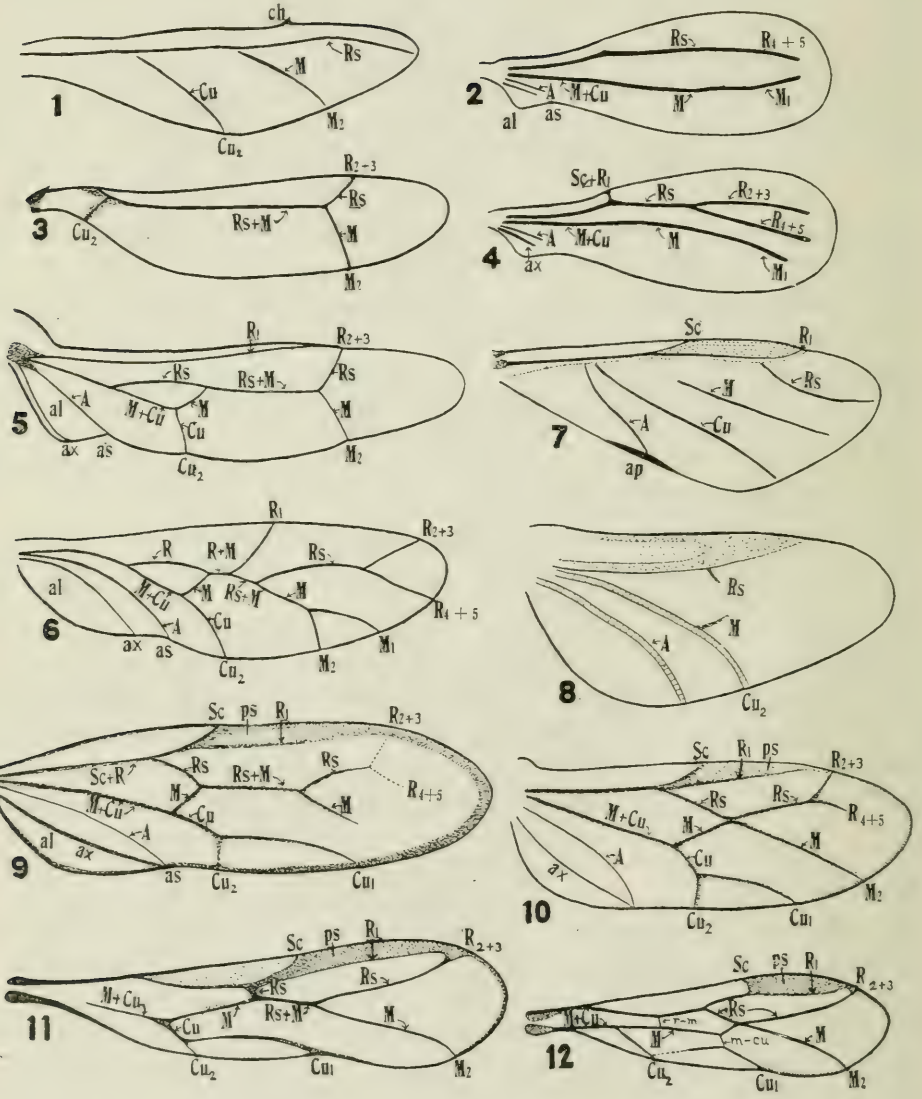
ps...Pterostigma.

R ...Radius.

R_s ..Radial sector.

Sc...Subcosta.

Can. Ent., Vol. LIII. Plate III.



COMPARISON OF WINGS OF ZORAPTERA, PSOCIDS AND APHIDS.

(See page 117)

EXPLANATION OF PLATE III.

Figures 2, 4, 5, 6, 8, 9, and 10 are based on figures by Escherich. Figures 1 and 7 are based upon figures by Patch, 1909.

Fig. 1...Right hind wing of Aphid *Macrosiphum solanifolii.*
Fig. 2...Right fore wing of Psocid *Embidotroctes paradoxus.*
Fig. 3...Right hind wing of Zorapteron *Zorotypus snyderi.*
Fig. 4...Right fore wing of Psocid *Embidopsocus luteus.*
Fig. 5...Right hind wing of Psocid *Archipsocus recens.*
Fig. 6...Right hind wing of Psocid *Psyllipsocus ramburi.*
Fig. 7...Right fore wing of Aphid *Pamphigus venafuscus.*
Fig. 8...Right fore wing of brachypterous form of Psocid *Archipsocus brasilianus.*
Fig. 9...Right fore wing of Psocid *Archipsocus recens.*
Fig. 10..Right fore wing of Psocid *Archipsocus brasilianus.*
Fig. 11..Right fore wing of Zorapteron *Zorotypus hubbardi.*
Fig. 12..Right fore wing of Zorapteron *Zorotypus snyderi,* after Crampton, 1921. This wing should be of same size as that of the Zorapteron shown in Fig. 11.

TWO NEW CANADIAN MAY-FLIES (EPHEMERIDAE).

BY J. MCDUNNOUGH, PH. D.

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In the second week of June, 1920, I collected from the underside of the leaves of an ash tree, situated near the banks of the Rideau river a number of specimens of both sexes of those tiny May flies belonging to the genus *Baetis.* At the time I supposed I was collecting *Baetis pygmaea* Hagen, but a careful study of the entire material at a later date convinced me that three species were represented and could be fairly readily distinguished, even in a dried condition, by the relative size of the superior, reddish portion of the eyes.

It became necessary therefore to determine whether the true *pygmaea* was represented in my catch and specimens of all three species were submitted to Dr. Nathan Banks of the Cambridge Museum, Mass. Dr. Banks was kind enough to compare these specimens carefully with the remains of the type ♀ of *B. pygmaea* (one wing and a portion of thorax) as well as with the type ♀ of *B. unicolor* Hagen and co-types of *B. propinquus* Walsh. One of the species he definitely identified as *propinquus,* the other two he reported as probably new, both being considerably larger than *pygmaea* and showing constant differences in venation, notably in the hinder portion of the wing.

Unicolor was described from ♀'s only, collected in Washington, D. C., and until the correct ♂'s can be definitely associated with the opposite sex, identification of this species must remain doubtful. The same is more or less true of *pygmaea;* the type locality is given as "St. Lawrence River" and until we have more definite knowledge of the *Baetis* forms inhabiting this river, it would be mere guess work, in view of the very close superficial resemblance between the

* Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

species of this group, to associate the name definitely with any of our Ottawa species. The only other name in this genus which might possibly have been applied to our forms was *rubescens* Prov., a species unknown to Dr. Banks. Through the kindness of Canon Huard I have received for study the only two species in the Provancher Collection labelled with this name in Provancher's handwriting; one specimen, a ♀, is very evidently not the type nor even correctly associated; it is a species of *Chirotenetes*. The other, a ♂, agrees well with Provancher's short description, having the costa and base of primaries and a good portion of the secondaries tinged with ruddy colour. It does not however belong in the genus *Baetis* but in *Baetisca* and is apparently distinct specifically from *obesa* Say, the sole species at present included in the genus. I propose making this specimen the Lectotype and transferring the specific name to the correct genus.

In view of the above facts it seems advisable to give names to the two unknown species; the ♂'s may be separated from one another as follows:—

a. Superior eyes large, kidney-shaped; intercalaries on primaries well developed, especially between subcosta and radius. . . *intercalaris*, n. sp.

a¹ Eyes smaller, oval; intercalaries between subcosta and radius either faint or entirely lacking.

b. Superior eyes moderate, roundly oval; thorax of ♂ shiny black . . . . . *propinquus* Wlsh.

b¹ Superior eyes small, lengthily oval; thorax brown with distinct lateral yellow spot on prothorax extended backward by a line to base of wing. . . . . *flavistriga, n. sp.*

All the species agree in the ♂ sex in the type of abdominal marking, the first and the last three segments (apart from genitalia) being brown, the remainder hyaline white with black stigmatal dots. A detailed description of the new species follows:—

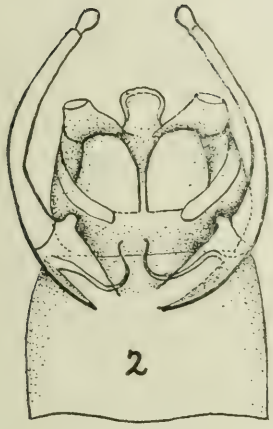
Baetis intercalaris N. Sp.

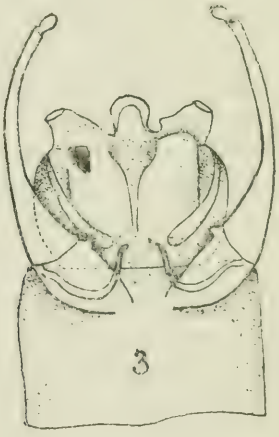
♂. Length of wing (from center of thorax to wing tip) 5 mm; length of body 4½ mm; length of abdominal setae 9-10 mm. Legs pale yellowish, antennae blackish at base shading to whitish at tips; lower eyes black; superior eyes large, brownish red, kidney-shaped, pale around the rims, which in dried material are usually curled up. Thorax black-brown, slightly marked with yellowish on the dorsal protuberances and with a yellowish lateral prothoracic line extending to base of wing; abdomen with basal segment dull brown, last three segments ruddy-brown dorsally; remaining segments pale yellowish white; beneath all segments but the first uniformly whitish; genital organs pale; setae white. Wings with the intercalaries on primaries well marked, the two in the interspace between subcosta and radius particularly long; cross-veins between branches of cubitus distinct.

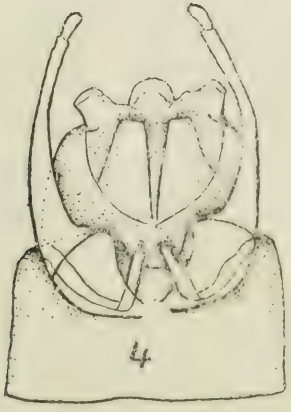
In the genitalia the penes are curved, rod-like, tapering to a very fine point, slightly bent at tip.

♀. Eyes small, wide apart, blackish; face variegated brown and yellow; dorsum of thorax slaty-black, laterally and abdominally brownish; abdomen brownish above, dull yellowish gray below; setae dirty white, duller than in ♂; legs

Can. Ent., Vol. LIII. Plate IV.







NEW CANADIAN MAY-FLIES

(See page 117)

deeper in colour than in ♂; venation similar to that of ♂.

Holotype. 1 ♂, Ottawa (June 11th.) in Canadian National Collection.

Allotype. 1 ♀, Ottawa (June 11th.) in Canadian National Collection.

Paratypes 6♂'s, 6♀'s, Ottawa (June 11-14) in Canadian National Collection and Cambridge Museum Collection.

Baetis flavistriga N. Sp.

♂. Size and general appearance of the preceding species; the superior eyes however much smaller, forming, even in dried specimens, flat, oval disks of a deep reddish brown colour, which often slightly overlap. Thorax with the yellow prothoracic spot and streak well-defined; legs dirty ochreous. Primaries with the intercalaries less developed than in the preceding species, those between subcosta and radius being much shorter; the cross-veins between the branches of the cubitus are also quite faint in distinction to *intercalaris* where they are well-developed. In the genitalia the penes are of more or less even width throughout and do not taper to the fine points found in *intercalaris*.

Holotype. 1 ♂, Ottawa (June 14th) in Canadian National Collection.

Paratypes. 5 ♂'s, same locality and date, in Canadian National Collection and Cambridge Museum Collection.

I have not yet definitely associated the ♀'s of the above species; a series of this sex is before me which differs from the ♀'s of *intercalaris* in possessing a broad pale yellow dorsal stripe on the abdomen and further shows the differences in venation mentioned above. These specimens however may belong to *propinquus* Wlsh. as Dr. Banks mentions to me that the female cotype of this species appears to possess such a stripe. In view of this I have thought it better to leave the matter in abeyance until such time as further collecting or breeding can settle the doubt.

Explanation of Plate.

Fig. 1 Venation of forewing of *Baetis intercalaris* McD.

Fig. 2 Male appendages of *Baetis intercalaris* McD.

Fig. 3 Male appendages of *Baetis flavistriga* McD.

Fig. 4 Male appendages of *Baetis propinquus* Walsh.

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POPULAR AND PRACTICAL ENTOMOLOGY.

STRIGODERMA ARBORICOLA FAB.—ITS LIFE-CYCLE (SCARAB. COLEOP).

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*Contribution No. 59 from the Entomological Laboratory, Kansas State Agricultural College. This paper embodies some of the results of the investigations undertaken by the author in the prosecution of project No. 100 of the Kansas Agricultural Experiment Station.

INTRODUCTION.

Continuation of the work on the life-cycle of insects injurious to the roots of staple crops, begun at this station in 1916, has revealed the following life-cycle of *Strigoderma arboricola* Fab. This species of the family Scarabæidae, sub-family Rutelini, occurs somewhat generally throughout the state of Kansas. Popenoe (1877) records the beetles from western Kansas, and states that they are quite rare at Topeka. Casey (1915) gives the range of *Strigoderma arboricola* as occurring from New Jersey and Canada to Kansas. Only at rare intervals are they sufficiently abundant in Kansas to be of economic importance.

An opportunity to secure enough specimens to begin life history studies was afforded the writer by the collection of a number of the beetles by Prof. Geo. A. Dean at Abilene, Kansas, June 20, 1919. At this place they were found abundantly feeding on rose blossoms in a nursery where they were doing considerable damage. These beetles were brought to Manhattan where their subsequent life history was worked out. To date, the writer has been unable to find any reference to the life-cycle of this species in American literature.

The beetles were kept in large, covered tin pails containing damp soil. Various blossoms were fed to the adults and the soil examined daily after oviposition began. The freshly laid eggs were transferred to small depressions in closely packed soil in one ounce tin salve boxes where they were examined daily for hatching. Upon hatching, the young grubs were placed in individual salve boxes containing loose, damp soil, which was changed once or twice a week during the warm weather. They were kept constantly in a rearing cave (McColloch, 1917), where a somewhat constant temperature was maintained. The young grubs were fed bran until the second molt, when wheat grains were substituted. When the prepupal condition occurred, fresh soil was packed tightly in the salve box to approximate the natural condition of the pupal cell in which the transformations to the pupal and adult conditions took place.

FOOD PLANTS.

Hart and Gleason (1907, p. 244) record *Strigoderma arboricola* adults on flowers of clover, rose, *Opuntia humifusa* and *Monarda punctata*. Blatchley (1910, p. 986) records the beetles as occurring most commonly on flowers of wild rose, blackberry and the water willow, *Dianthera americana* Linn. The

following field notes are recorded by Vestal (1913, p. 45): "Notes taken June 24. The first *Strigoderma* was noticed a few days ago floating down the river. They are now excessively abundant on cactus, wild rose, red clover, timothy, elderberry, dewberry, dog fennel, *Verbena stricta*, wild parsnip, Monarda *punctata, Plantago, Saponaria, Tephrosia, Erigeron*. They are most abundant on prairie plants, being quite common in the bunch-grass association and along roadsides, very few being found in the forest'. July 3: '*Strigoderma* is still fairly abundant on different flowers. On July 6, a robber-fly, *Proctacanthus brevipennis*, was caught with a *Strigoderma* in its grasp, which it was in the act of eating." In Kansas, blossoms of wild and cultivated rose plants are apparently the preferred food of the beetles.

The grubs were not observed feeding in nature. However, the fact that they were reared on bran and wheat kernels in the same manner that the writer has reared Lachnosterna grubs seems to indicate that there is no apparent difference between the feeding habits of this species and those of the more common white grubs.

Life Cycle.

Adult.—The beetle is described by Blatchley (loc. cit.) as follows: "Oval, subdepressed. Head, thorax and scutellum dull blackish-green, shining; sides of thorax usually in part or wholly pale; elytra dull brownish-yellow, often suffused with fuscous or piceous, especially on the sides and along the suture; under surface and legs piceous, sparsely clothed with long grayish hairs. Head coarsely, roughly and confluently punctured. Thorax one-half broader than long, sides feeble curved, hind angles rounded, front ones acute; surface coarsely, shallowly and rather sparsely punctate, with an impressed median line on middle third and two irregular depressions on each side. Elytra with all the striæ distinct, entire and deeply impressed. Length 10-12 mm."

He further states that two specimens observed had the thorax, elytra and legs wholly reddish-yellow and others had the thorax wholly bluish-black. The beetles occur on blossoms from May to July, where mating probably occurs.

A collection of 53 specimens made July 9, 1885, in Wallace County, Kansas, indicates their relative abundance in western Kansas during July. Specimens in the Kansas State Agricultural College collection from Columbus, Ohio, bear a September label. The females enter the soil to oviposit and die soon afterward. Egg-laying occurs during June and July.

Egg.—The egg is oval in shape and nearly pearly-white in color. It is about 2 mm. long and 1.2 mm. wide when freshly laid. The eggs increase slightly in size with age and assume a more globose form until immediately preceding hatching, when they are about 2.5 mm. long and about 2 mm. wide. Hatching occurs early in July.

The following table shows the length of the egg stage as observed:

TABLE 1.—LENGTH OF EGG STAGE.

Date Laid 1919	Date Hatched 1919	Length of stage days	Date Laid 1919	Date Hatched 1919	Length of stage days
June 27	July 9	12	June 27	July 10	13
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	"	"
"	"	"	"	July 11	14
"	"	"	July 12	12	10
"	"	"	"	13	11
"	"	"	"	" "	11
"	July 10	13	"	" 14	12
"	"	"	"	" "	"
			Average		12.2
			Maximum		14.
			Minimum		10.

Larva.—The larva resembles the common white grubs. No definite characters separate it from Lachnosterna grubs. There is, as in Lachnosterna, a triangular patch of hairs on the last ventral segment with a median double row of mesad pointing spines. The head is light brown or tan.

Before hatching the grub can be seen within the egg. When freshly hatched the head is white, except the tip of the mandible, but soon the whole head darkens to its characteristic color. Newly hatched larvæ are about 4 mm. long. As before stated, hatching occurs early in July, and the winter is passed in this stage. The following spring the prepupal condition is reached and pupation soon occurs. The length of the larval and prepupal stages of four individuals raised to maturity are shown in table 2.

TABLE II.—LENGTH OF LARVAL STAGE.

Egg Hatched	Became Preputa	Length of stage to prepupa days	pupated	Length of prepupal stage days	Length of complete larval stage days
July 7, '19	May 26, '20	321	June 2, '20	7	328
July 10, '19	May 26, '20	319	June 2, '20	8	327
July 10, '19	May 31, '20	325	June 6, '20	6	331
July 13, '19	May 25, '20	322	June 29, '20	4	326
Average		321.7		6.2	328
Maximum		325		8	331
Minimum		319		4	326

Pupa.—The pupæ are from 10 to 12 mm. long. When freshly transformed they are creamy-white but they gradually darken as the adult colors are assumed. The four grubs reared to pupation, as noted in table II, were likewise successfully reared to adults. Their period of pupal life is shown in table III.

TABLE III.—LENGTH OF PUPAL STAGE.

Date Pupated	Date Adult	Length of Pupal stage days
June 2, 1920	June 14, 1920	12
June 2, 1920	June 13, 1920	11
June 6, 1920	June 20, 1920	14
May 29, 1920	June 12, 1920	14
Average		12.7
Maximum		14
Minimum		11

SUMMARY.

The beetles of *Strigoderma arboricola* occur during May, June, and July. Egg-laying occurs in June and July. The eggs hatch in from 10 to 14 days, and the grubs pass the winter in the soil, requiring an average of 321.7 days to reach the prepupal condition which in turn requires 4 to 8 days, making an average combined larval stage of 328 days. The prepupal stage varies in length from 11 to 14 days with an average of 12.7 days. The four individuals reared to maturity, with their egg stages added, required 351, 352, and 358 days for complete development.

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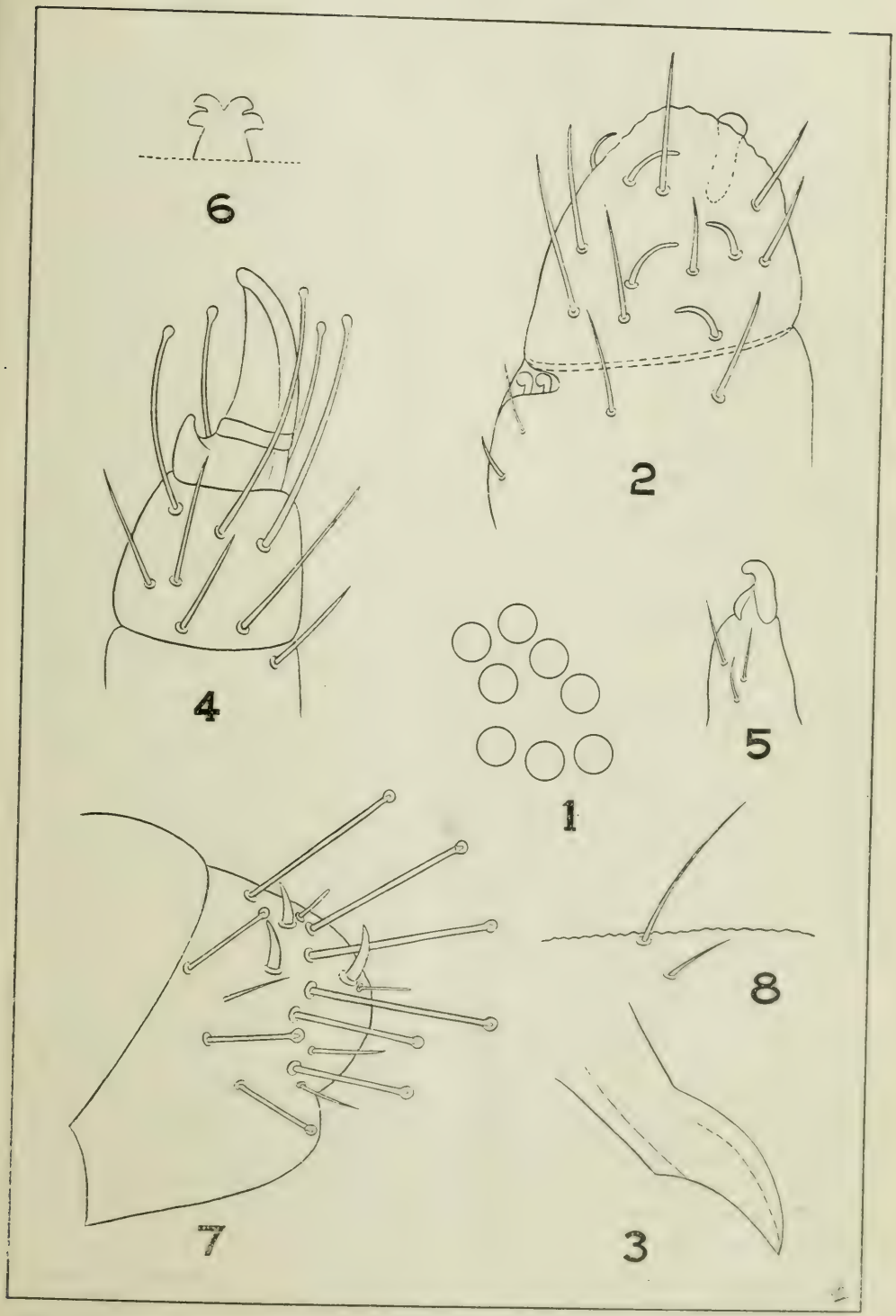
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A NEW SPECIES OF FRIESEA (COLLEMBOLA).

BY CHARLES MACNAMARA,
Arnprior, Ontario.

There are no such things as equinoctial gales. More of our old friends are gone. They have been sent by the metereologists to try vainly of course—to blow William Tell's arrow from its mark or to flutter the Lincoln green cloak of Robin Hood, in that limbo of lost illusions where the moon controls the weather, and fixes the time when we should kill the pig; and where all the animals know if the snow is going to be deep next winter.

Therefore, although it occurred within a few days of the March equinox a couple of years ago, the gale that blew the top off a large maple in Elliott's sugar bush near Arnprior must be named without any qualification in respect of the time of year it happened. But it may be fairly recorded as an example of the proverbial ill wind; for if it blew Mr. Elliott no good in breaking the top off his tree, it led me to the always pleasing discovery of a new species.

The fallen top was about ten feet long by eight or ten inches in diameter. It had broken from a tree some 75 feet high, and its few stubby branches were smashed off in coming down. I chanced on it within twenty-four hours after it fell. The temperature was a little above freezing, but the day was raw and overcast, and there was still three or four inches or hard crusted snow on the ground. It was the moss on the bark that first attracted me. Moss means moisture, and moisture means springtails. It is strange how enormously standards of value differ. A dozy log with loose mossy bark is an absolutely worthless "dead cull" to a lumberman, while to a Collembolan hunter it is a delightful and valuable find. The bark on this log proved to be loose only in spots, but here and there under the flakes were considerable numbers of the white cast skins of Collembolans, an unfailing indication of the gregarious kinds, although as the skins may persist for several years, they are often present long after the colony that shed them has become extinct. But close examination with a magnifier presently discovered some very small slow pellid springtails, which I put down as a species of Xenylla; and young Xenylla maritima Tullb.—apparently about quarter grown—they turned out to be when I got them under the microscope at home that night. Not a very exciting capture this, as X. maritima is common under bark around here.

On a cold rainy day a week later I reached the sugar bush again; and although it had yielded nothing of interest before, somehow I gravitated to the fallen top once more. This time, besides a few additional specimens of the tiny Xenyllans, I captured half a dozen handsome olive-green Isotoma determinata MacG., another not infrequent bark dweller in my district. Then I found a single light grey Collembolan, small but strongly built, and further searching resulted in three more of them. They were all numb with the cold when I picked them up, but in the vial they livened up a bit, and began to walk around.

I did not recognize them for any springtail I knew, though they looked a little like an Achorutes. But determination of Collembola in the field is very uncertain, and two or three times my supposed prize has turned out to be only

another variety of the protean and ubiquitous *Achorutes armatus* Nic. So these unknown specimens I carried home without any great hopes.

And it was with no more than a mild curiosity that I prepared a specimen that evening for microscopical examination. The color that looks grey under the pocket magnifier is shown by the microscope to be a pale violet. Unguiculi are wanting, so the insect does not belong to the *Achorutes*, that genus being always provided with these little supplementary claws. A drop of potash solution is drawn under the cover-grass to clear up the pigment. The eyes can now be counted, and there are eight of them on each side, and no postantennal organs. Then suddenly interest flares up. *Three anal spines!* A hurried search in Guthrie and Folsom—this is a *Friesea*, and the only one of the genus ever recorded in North America before was described by Guthrie, who, finding it in a greenhouse, suggests that it is an exotic. My species does not fit Guthrie's description, and living at the top of a 75 foot maple in a locality that might almost be called the backwoods, it certainly cannot be anything but a native Canadian.

The next care was to get more specimens, and the following day I searched the fallen top for two hours and found two more; rate: one specimen per hour. The top was close to Mr. Elliott's sugar-house, and as he was making ready for the spring sap-boiling, I was afraid he might cut up my precious log for fuel, so I asked him to spare it. He readily agreed, albeit with an indulgent smile that might greet the naive request of a child or a slightly demented person. But my precautions were unnecessary, for I completely unbarked the log without finding a single additional specimen on it.

I searched also in vain the trunk of the tree from which the top had fallen and many other trees around. They yielded numerous other Collombolans but no more Frieseans.

Nor did I find any more anywhere else all summer, although I looked for them in all kinds of places, likely and unlikely. It was not until late in the autumn that they came into my life again; and strange to say, they were again found in a fallen maple top. On the 26th October fate led me through a hardwood grove 300 or 400 yards to the east of the sugar-bush of original discovery. There I noticed a maple lately broken off about 40 feet up, and the 15 or 20 foot top, with its butt on the ground was standing upright against another tree. The nice loose-looking bark of the broken piece appealed to me, and I began to pry pieces off, and examine them with my watchmaker's glass. Almost immediately I saw my Friesea again. This time they were gathered in groups of five or six, and many individuals were much larger than any of those I had taken in the spring. In the course of the next few days, before all the loose bark was removed, I collected here with delight 30 or 40 good specimens. After the poverty of six small individuals that I had suffered from before, this was affluence, and should have contented me. But no collector is ever really satisfied. There *is* no wealth beyond the dreams of avarice, and I felt like John D. Rockfeller when he had saved his first ten millions.

And so the quest of the *Friesea* continued. Numerically, the subsequent results have been poor, only two specimens having been collected during the past year. But the remarkable feature of this, the third separate discovery of

the species, was that the insects were again disclosed living at the top of a maple tree. The two specimens were taken from under the bark of a short thick branch, lately fallen, like the first broken top, from the summit of a large maple in Elliott's sugar-bush.

In each instance the conditions under which the insects were found precluded any chance of their having made their way from the ground onto the fallen piece after it had come down. They had certainly been living in the tops of the trees. Of course, numerous Collembolans live all over trees from root to crown wherever there may be a little moisture or rotten wood; but this species appears to live in the tops only. However, I can see no good reason why this should be their only habitat, and it is probable that eventually they will be found in lowlier stations.

As appropriate to their apparent predilection for high places, the species is named "sublimis", the word—which was kindly suggested to me by Mr. F. J. A. Morris of Peterborough—being used in its primitive sense of "raised up."

The genus *Friesea* Dalla Torre comprises only five described species including the subject of this paper. The discovery of the present species necessitates a few changes in the generic description which should now read as follows:

Genus **Friesea** Dalla Torre

Eyes eight on each side as a rule; five on each side in *F. decemoculata* Borner. Postantennal organs absent. Antennae four-segmented. Mandible without molar surface. Head of maxilla simple. Unguiculi absent. Furcula short, weakly developed in most species; well developed in some species; mucro hooklike. Anal spines three. Anal segment small; supra-anal valve rounded semi-globose. Body without segmental tubercles, cuticula tuberculate.

Friesea sublimis, n. sp.

Color, pale lilac on silvery white ground, the head being slightly darker than the body; under parts lighter and body sutures white. *Eyes,* (fig. 1) eight on each side. No postantennal organ. *Antennae* (fig.2) subconical, three-quarters length of head; third and fourth segments confluent dorsally but suture shows ventrally; fourth segment with five or six thick curved olfactory setae as well as many straight, tapering hairs; stout capitate protusible sense organ in a deep pit on apex just inside median line, another sense organ of two thick hooked members distally in a recess on outer side of third segment. *Maxilla* (fig. 3) with simple head and acute apex. *Mandible* with several distal inner incisive teeth and no molar surface. *Unguis* (fig. 4) stout, curving, untoothed; unguiculus represented by a rounded lobe only; front feet usually with four knobbed tenent hairs, and mid and hind feet with five such hairs, but sometimes the hairs immediately above these are knobbed also making a total of six, seven or eight tenent hairs; tibiotarsus with a distal subsegment. *Furcula* (fig. 5) not rudimentary, but short, not reaching to second abdominal segment; dentes not reduced, stout, with three dorsal setae; mucro one quarter length of dens, with strong apical hook and prominent rounded lamella. *Tenaculum* bidentate,

in outline as fig. 6. *Anal spines,* (fig. 7) three in a triangle, with proximal base and distal apex, slightly curved, sharp, three-fifths length of hind ungues, on low papillae. The anal and genital segments bear many long straight setae with conspicuous round heads, and a few simple setae interspersed. *Clothing* (fig. 8) a few short curving setae. *Integument* finely tuberculate. Maximum length, 1 mm. Found under bark, April and October, near Arnprior, Ontario.

Compared with the powerful springing apparatus of an expert leaper like *Isotoma palustris* Mull., the furcula of *Friesea sublimis* appears small and weak. Nevertheless it is much better developed than in any other known member of the genus, and it is that that chiefly distinguishes the new species. The furculas of all other described Frieseans are little more than rudimentary, but with F. sublimis, though short, it is actually functional, and I have seen them leaping a distance of two or three inches, though they seldom indulge in the practice. The maxilla as shown in fig. 3 is a conspicuous object in the head when the specimen is depigmented.

As usual, I am much indebted to Dr. J. W. Folson of the University of Illinois for advice and assistance in describing this species.

EXPLANATION OF PLATE V.

Fig. 1. Eyes of left side, x 600
2. Left antenna, x 1200
3. Maxilla, x 900
4. Left hind foot, x 1500
5. Dens and mucro, x 1000
6. Tenaculum in outline x 1500
7. Anal segment showing spines and capitate setae, x 800
8. Clothing of first abdominal segment, x 1000

MISCELLANEOUS STUDIES IN THE COLEOPTERA—NO. 1.

BY FRANK E. BLAISDELL, SR.
Stanford University, Calif.

The following new species and races of American Coleoptera were found among a number of other species recently submitted to me for identification.

Listrus provincialis, New Species

Form oblong-ovate, about three times as long as wide and slightly robust *Colour* black; mouth-parts, antennae and tarsi more or less piceous; second antennal joint frequently paler.

Pubescence moderate in length, recumbent, linear and subsquamiform, quite dense and argenteo-plumbeous to luteo-cinereous in colour. Dark hairs arranged as follows: basal parascutellar and humeral macules very small or obsolete; post-basal macule at middle of each elytron, small and irregularly rounded; a rather slender transverse submedian fascia slightly behind the middle, zic-zac, and scarcely attaining the lateral margin or suture; subapical fascia similar or broken into two macules on each elytron; apical macules very feebly indicated or obsolete. Median pronotal macule more or less broken into four parts, two small anterior dots and two larger and slightly elongate, posterior dots; lateral

semilunar vittae feeble or more or less obsolete, sometimes represented by a small rounded macule; central area of the frons slightly darker.

Head subquadrate, moderate in size, broadly and very feebly impressed between the eyes, densely indentato-punctate, with a small rounded, glabrous convexity opposite the middle of the base of the clypeus. Eyes moderately large, and rather prominent, quite broadly convex and entire. Antennae similar in the sexes, extending to about one joint beyond the pronotal base; rather stout, outer joints moderately compressed, second oval and not stout, about as wide as long, third cylindro-obconical, about twice as long as wide, fourth as long as wide, subtriangular, fifth distinctly wider than the preceding and slightly wider than the three following joints, a little longer than wide and subtriangular; succeeding joints scarcely serrate anteriorly, sixth to the eighth subequal in size, triangular, anterior angle more obtuse than that of the fifth, ninth a little larger and stouter, obtusely rounded anteriorly, triangular, scarcely transverse, tenth still wider, slightly transverse and triangular, eleventh obovate, about twice as long as wide and compressed at apex.

Pronotum about a fourth wider than long, rather strongly and evenly convex from side to side; apex broadly and feebly arcuate in circular arc; sides quite broadly arcuate in basal two-thirds, thence feebly convergent to apex, more abruptly so at base, the latter broadly and not strongly arcuate, distinctly sinuate laterally into the rounded or obtuse basal angles; apical angles rounded; disk densely indentato-punctate, laterally indentato-punctato-reticulate. Lateral fimbriae moderate in length and backwardly curved; serrulations small and unequal in size.

Elytra oblong, rather parabolically rounded at apex, a little more than twice as long as wide; feebly convex at the disk, rather strongly so laterally; punctures rather close, somewhat coarse, separated by a distance equal to about twice their diameter; surface more or less granulato-reticulate, punctures somewhat impressed, intervals almost transversely prominent; humeri not at all prominent, rounded and obtusely rectangular.

Abdomen densely and finely reticulato-punctulate, fifth segment more strongly so. Apex of abdomen rather densely clothed with moderately long brownish or blackish hairs in both sexes.

Legs moderate in stoutness and length.

Male.—rather more oblong and less arcuate at the sides; fifth ventral segment truncate and distinctly sinuate at apex but not deeply so.

Female.—More ovate, sides more arcuate; fifth ventral rather strongly rounded at apex.

Measurements.— Length, 2.8-3 mm.; width, 1-1.1 mm.

Holotype, male, and *allotype,* female, to be deposited in the National Collection at Ottawa. *Paratypes* in the collection of Mr. Ralph Hopping and that of the author.

Type locality.—Spious Creek, near Merritt, B. C. Collected on May 23rd, 1920. Mr. Hopping has also taken it at Midday Creek, B. C., collected July 13th, 1920.

I cannot consider that Casey's *Listrus plenus,* taken on Vancouver Island, is the same as the present species for the following reasons: In *plenus* (female)

the antennae are slender, pronotal disk deeply and very closely perforato-punctate, interstices narrow, sparsely and feebly punctulate; pubescence denuded in *large irregular areas* on the elytra. In *provincialis* the antennae are moderately stout, pronotal disk densely indentato-punctate, intervals mere lines between the punctures and indentations, and finally the elytral dark pubescent areas are in well defined *small macules* or macules and narrow fasciae.

Eleodes (Litheleodes) extricata var.**utahensis** n. var.

Form fusiform-ovate to ovate, moderately strongly convex. Colour black, dull in lustre and alutaceous; surface smooth and the sculpturing feeble.

Head and pronotum finely punctulate, rather densely so on the frons. Antennae rather slender.

Pronotum slightly wider than long, evenly convex, punctures not denser laterally; apex truncato-sinuate in circular arc, angles subacute and somewhat prominent anteriorly; sides broadly and about equally arcuate from apex to base, marginal bead very fine; basal angles obtusely rounded; base broadly arcuate; apex and base almost equal in width.

Elytra oval, base broadly and feebly sinuate, scarcely wider than the contiguous base of the pronotum; humeri subacute, not at all prominent nor exposed; sides broadly and evenly arcuate to apex, gradually oblique to the obtuse apex; disk moderately convex, rather broadly arcuate laterally into the somewhat inflexed portion; punctures fine in closely placed longitudinal series, more or less confused laterally and on the inflexed sides and apical declivity.

Abdomen feebly and sparsely punctulate; obsoletely rugulose on first two segments.

Legs moderately long and rather slender.

Male.—Narrower. Anterior femora with an obtuse salient. Abdomen moderately convex and horizontal. Anterior tarsi without tufts of pubescence on the first joint at tip beneath, plantar grooves open on all the joints.

Female.—Broader, ovate. Abdomen rather strongly convex.

Measurements.—Length, (types), 16.5-16 mm.; width, 5.3-6.0 mm.

Holotype, female, and *allotype*, male, in the author's collection; *paratypes* in that of Mr. Warren Knaus.

Type locality.—Milford, Utah. Collected by Mr. Warren Knaus at an elevation of 4900 feet, on June 29th, 1919.

The differential characters are, the dull alutaceous lustre, smooth surface, fine inconspicuous punctuation and slender antennae. In typical *extricata* Say, also in the race *cognata* Hald., the plantar groove on the first joint of the anterior tarsi is closed at tip by a small tuft of golden pubescence. This tuft is absent in the male of *utahensis*. The latter race should precede the race *cognata* in our lists.

Eleodes (Litheleodes) vandykei variety **modificata** n. var.

Similar to *vandykei*, except that the elytra are moderately coarsely muricato-rugose throughout, with intermixed punctures. Form rather more ovate than in *vandykei*. Recent studies have lead irresistably to the conclusion that *vandykei* is a distinct species and not a race of *letcheri* Blais.

Measurements.—(Male and female). Length, 14-14.5 mm.; width, 6-7.3 mm.

Holotype, male, and *allotype*, female, to be placed in the National Collection at Ottawa. *Paratypes* in the collection of Mr. Ralph Hopping and that of the author.

Type locality.—Vernon, B. C. Collected April 6th, 1920, by Mr. Ralph Hopping.

The elytral sculpturing in *modificata* is almost like that seen in *Eleodes cuneaticollis* Casey.

The following tabulation of characters will help in the recognition of *letcheri* and *vandykei* with its races:

Elytra muricately punctate.....1

Elytra more or less muricato-granulate.....3

1. Elytra sparsely pubescent with rather long flying hairs.....*letcheri* Blais
. Elytra with short setae.....2.
2. Elytra densely and muricately punctured, minutely so on the dorsum .....*vandykei* Blais.
-. Elytra densely and moderately strongly muricato-rugose with intermixed punctures .....var. *modificata* n. v.
3. Size usually smaller, pronotum relatively smaller and quadrate; granules subtuberculate and more or less arranged in evident longitudinal series.....var. *parvula* Blais.

In *parvula* the pronotum is noticeably smaller, more quadrate, with the sides less arcuate and parallel.

The species of the subgenus *Lithelcodes* may be arranged in the following sequence:

Eleodes (Litheleodes) arcuata Casey.
extricata Say.
Var. *convexicollis* Blais.
var. *utahensis*, new variety.
var. *cognata* Hald.
var. *arizonensis* Blais.
granulata Lec.
var. *obtusa* Lec.
var. *corvina* Blais.
papillosa Blais.
letcheri Blais.
vandykei Blais.
var. *parvula* Blais.
var. *modificata* Blais.

NEW NEARCTIC CRANE-FLIES (TIPULIDAE, DIPTERA). PART XI.

BY CHARLES P. ALEXANDER,

The types are preserved in the collection of the writer unless stated otherwise. The material from Idaho is preserved in alcohol; paratypes of certain of these species are placed in the collection of the United States National Museum at the request of Mr. Shannon.

Limnophila (Idioptera) shannoni, new species

General coloration (in alcohol) dark brown; coxae and trochanters light

yellow; wings greyish yellow, the cross veins and deflections conspicuously seamed with greyish brown; male hypopygium with the outer pleural appendage simple.

Male.—Length about 6.5 mm.; wing 8 mm.

Female.—Length 7.8 mm.; wing 8.4 mm.

Described from alcoholic material.

Rostrum and palpi dark brown. Antennae of the male long, if bent backward extending about to the base of the abdomen; scapal segments pale yellowish brown, the flagellum dark brown. Head dark brown, the genae paler.

Thorax dark brown, with no stripes evident in alcoholic material. Halteres pale, the knobs a little darker. Legs with the coxae and trochanters light yellow; femora yellow, broadly tipped with dark brown; tibiae brownish yellow; tarsi pale brown. Wings with a faint greyish yellow tinge, the wing-base and the costal and subcostal cells more yellowish; stigma oval, dark brown; conspicuous greyish brown seams at the origin of R_R; at Sc_2; along the cord and outer end of cell 1st M_2 and along the supernumerary crossveins; veins dark brown. Venation: Sc_2 some distance from the tip of Sc_1, this distance slightly variable; R_1 bent caudad at R which is inserted on R_2 a little more than its own length beyond the fork and on R_1 about its length from the tip; R spurred at origin, in alignment with R_{2+3}; basal deflection of R_{4+5} and R in oblique alignment; petiole of cell M_1 much shorter than this cell; basal deflection of Cu_1 slightly before midlength of cell 1st M_2.

Abdomen dark brown. Male hypopygium with the pleurites stout; two pleural appendages, the outer appendage simple, narrow at the base, gradually widened to the squarely truncated apex, the outer margin and apex provided with numerous small appressed spines; inner pleural appendage a little longer than the outer, gradually narrowed to the bluntly rounded apex, the surface provided with setae.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Allotopotype, ♀.

Paratopotypes, 1 ♂, 1 ♀, the latter teneral.

This species and the next are of very considerable interest as being the first American representatives of the group typified by *L. (I.) trimaculata* (Zett.) of northern Europe. The genitalia are of a structure that differs in several respects from that of the type of the subgenus *Idioptera*, however, and it may be that all these species are not true members of *Idioptera*. It is with great pleasure that this interesting fly is dedicated to Mr. Shannon as an appreciation of his kind help in collecting Tipulidae in various parts of the United States.

Limnophila (Idioptera) bifida, new species.

General coloration (in alcohol) brownish black; coxae and trochanters obscure yellow; wings dusky grey, the stigma slightly darker; no distinct darker markings on the wing; male hypopygium with the outer pleural appendage profoundly bifid.

Male.—Length about 5 mm.; wing 6 mm.

Female.—Length about 6.5 mm.; wing 6.7 mm.

Described from alcoholic material.

Head, rostrum and palpi brownish black. Antennae brownish black, the distal segments a little paler, if bent backward extending to (♀) or beyond (♂) the wing-root; flagellar segments in the ♂ rather elongate.

Mesonotum and pleura dark brown, the dorso-pleural membranes paler. Halteres elongate, pale, the knobs slightly darker. Legs with the coxae and trochanters obscure yellow; remainder of the legs light brown, the tips of the femora and tibiae slightly darker. Wings with a strong dusky grey tinge; wing-base slightly yellowish; stigma oval, darker grey; exceedingly faint markings at the origin of R and along the cord; veins dark brown. Venation: S_C long, S_{C^1} extending to about four-fifths the long R_s, S_{C^2} removed a short distance from the tip of S_{C^1}; R_s long, strongly arcuated at origin, in alignment with R_{2+3}; R_{2+3} rather long, about twice the deflection of R_{4+5}; very faint; beins R_2 and R_3 divergent; cell R_2 at the margin wider than either cells 2nd R_1 or R_3; petiole of cell M_1 about as long as the cell; basal deflection of Cu_1 at about one-third the length of cell 1st M_2; supernumerary crossvein in cell M a short distance beyond the origin of R_s.

Abdomen dark brownish black. Male hypopygium with the ninth tergite bifid, the lobes narrowly rounded at their tips and provided with blackened spines; pleurites short and stout, the apex of each produced into a flattened lobe; outer pleural appendage very broad, profoundly bifid, the dorsal blade flattened, with the inner margin provided with four or five appressed acute teeth; the ventral blade is narrower, a little shorter, at the tip with a few acute erect spinules; inner pleural appendage flattened, very short and high, rapidly narrowed to the blunt apex, provided with numerous setae. Ovipositor long and slender, the tergal valves upcurved, horn-color.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Allotopotype, ♀.

Rhaphidolabis (Rhaphidolabis) subsessilis, new species.

General coloration (in alcohol) brownish yellow, the praescutum with a conspicuous dark brown stripe; antennae with twelve segments; wings subhyaline; stigma faintly darkened; cell R_3 sessile or subsessile; abdomen dark brown.

Male.—Length about 5.2 mm.; wing 6.7 mm.

Female.—Length about 6.5 mm.; wing 7.4 mm.

Described from alcoholic material.

Rostrum and palpi brown. Antennae with twelve segments, dark brown, the last segment one-half longer than the penultimate. Head dark brown.

Pronotum obscure brownish yellow, broadly dark brown medially. Mesonotum brownish yellow, the praescutum with a conspicuous median dark brown stripe that is narrowed behind, ending before the suture; lateral stripes very indistinct. Pleura brownish yellow. Halteres pale, the stem darker. Legs with the coxae and trochanters brownish yellow; remainder of the legs brown, the tarsal segments darker. Wings subhyaline, iridescent, the stigmal area faintly brownish; veins dark brown. Venation: R moderately elongated, strongly arcuated; cell R_3 sessile to very short petiolate; outer deflection of R_2 less than its own length from the tip of R_1; cell 1st M_2 open; cell M_1 present, the branches

that enclose it widely divergent.

Abdomen dark brown, paler laterally. Male hypopygium with the distal lateral angles of the pleurite provided with numerous blackened spines; proximal face of pleurites with long, erect bristles; two pleural appendages, these short and stout, approximately equal in size, the outermost clavate, the head with numerous black spicules; inner appendage pale, the apex broadly and obtusely rounded. Lateral gonapophyses long and slender, approximately as long as the pleurites themselves.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Allotopotype, ♀.

Rhaphidolabis subsessilis is closely related to *R. rubescens* Alex. (Northeastern North America) but is readily told by the presence of but twelve antennal segments, the coloration and the elongate lateral gonapophyses of the male hypopygium. In its general appearance it is more like *R. major* Alex. (Colorado), a very different fly.

Rhaphilolabis (Plectromyia) reducta, new species.

General coloration (in alcohol) pale brownish yellow, the praescutum indistinctly darker medially; antennae with only eleven segments; wings hyaline, the stigma lacking; cell R_3 petiolate; abdomen with a subterminal darker brown ring.

Male.—Length 4.2 mm.; wing 5 mm.

Described from alcoholic material.

Rostrum obscure yellow; palpi short, brown. Antennae brown, the basal segment paler; flagellum with only nine segments; flagellar segments long-oval, gradually decreasing in size to the end. Head yellowish brown.

Mesonotum pale brownish yellow, the praescutum indistinctly darker medially; scutal lobes slightly darkened. Pleura yellow. Halteres pale, the knobs brown. Legs with the coxae and trochanters light yellow; remainder of the legs pale brown, the tibiae a little darkened at the tips. Wings hyaline; stigma lacking; veins brown. Venation: R_{2+3} comparatively short, strongly arcuated; petiole of cell R_3 long, subequal to the basal deflection of R_{4+5}; outer deflection of R_2 perpendicular or nearly so, close to the tip of R_1; cell M_1 lacking, as in the subgenus, petiole of cell M_2 longer than this cell; basal deflection of Cu_1 a short distance beyond the fork of M. very faint, without macrotrichiae.

Abdominal tergites light brown; sternites more yellowish; segments seven and eight dark brown. Male hypopygium with the pleural appendages short, stout, the tips blunt; one appendage is more slender, near the tip provides with several spinous setae, the other appendage very short and stout with the distal and blunt, set with several short spines and about two long, delicate bristles.

Habitat.—Idaho.

Holotype, ♂, Moscow Mt., July 25, 1920 (R. C. Shannon).

Paratopotype, ♂.

This small fly presents an appearance that is very similar to the type of the subgenus Plectromyia except that the cell R_3 is petiolate. The reduction in number of antennal segment is very interesting and difficult of explanation. Within the group Dicranotae there is now found a range of from eleven to

fifteen antennal segments (11 in *Rhaphidolabis reducta;* 12 in *Rhaphidolabis subsessiles,* and *Dicranota nipponica;* 13, the normal number for the group; 14 in *Rhaphidolabis flavibasis;* 15 in *Rhaphidolabis fascipennis* and other Oriental species).

Dicranota rogersi, new species.

General coloration gray; mesonotal praescutun with three broad dark brown stripes; antennae of male elongate; wings faintly tinged with brown; stigma dark brown; a paler brown seam along the cord; cell M_1 normally present; cell 1st M_2 open by the atrophy of *m.* male hypopygium with two subequal pleural appendages; the chitinized blade at base of pleurite with the stem less elongate than in *D. eucera.*

Male.—Length about 5.8 mm.; wing 6.6—7.5 mm.

Female.—Length about 7.5 mm.; wing 9.3 mm.

Rostrum brown, grayish pruinose. Antennae with 13 segments, in the male very long, if bent backward extending nearly to the base of the third abdominal segment; first scapal segment obscure reddish; remainder of antennae dark brown; flagellar segments elongate cylindrical. Head dark brown, the vertex adjoining the eyes broadly yellowish gray.

Mesonotal praescutum with a yellowish gray pollen, with three conspicuous dark brown stripes, the broad median stripe very indistinctly split anteriorly by a capillary pale line; interspaces with erect yellow setae; scutum yellowish gray, the centers of the lobes dark brown; scutellum and postnotum light gray. Pleura gray. Halteres pale, the knobs slightly darkened. Legs with the coxae pale, with a sparse grayish pollen; trochanters obscure yellow; femora dark brown, yellowish basally; remainder of legs dark brown. Wings faintly infuscated; stigma conspicuous, dark brown, occupying cell 2nd R_1 and the distal end of cell Sc_1; paler brown seams along the cord and at the origin of R_S; veins dark brown. Venation: S_C long, extending to slightly beyond r ; S_C far before fork of R_{+} , the distance a little greater than that section of S_C beyond R_S ; R_S moderately long, angulated at origin; R_{2+3} about equal to the deflection of R_2; *r* rather indistinct; R_2 less than its own length from the tip of R_1, entirely provided with macrotrichiae; cell M_1 present in normal individuals; cell 1st M_2 open by the atrophy of m; petiole of cell M_3 a little shorter than the cell; basal deflection of Cu_1 about one-half its length beyond the fork of *M.*

Abdominal tergites brown, with about the posterior half of each segment paler brown; sterites a little paler than the tergites. Male hypopygium with the pleurites short and stout, the caudal lateral angle produced into a short, blunt lobe; two sub-equal pleural appendages; outer appendage fleshy, provided with several long setae; inner appendage subchitinized, with a patch of long, erect setae on the proximal face at the base and a group of short setae on the outer face near the tip: at base of pleurite a chitinized blade that is produced into a beak-like structure with the point directed laterad.

Habitat.—Michigan.

Holotype, , Gogebic County, August 17, 1920 (J. S. Rogers).

Allotopotype,♀.

Paratopotypes, 8 ♂♀.

Type in the Collection of the Museum of Zoology, University of Michigan.

Dicranota rogersi is named in honor of my friend, the collector, Mr. J. Speed Rogers. It is most closely allied to *D. cucera* O. S., in the elongate antennae of the male sex. From this species it differs in the normal presence of cell M_1, the dark stigma and the details of structure of the male hypopygium, as the subequal pleurites.

A NEW PAPAIPEMA FROM DELAWARE (Lepidoptera, Noctuidae)

BY HENRY BIRD AND FRANK MORTON JONES.

(PLATE VI)

Although a collecting trip through peninsular Delaware and Maryland in July 1920 did not have the genus *Papaipema* as its primary object, the possibility of turning up interesting material in this group was well in mind, so that when our car stopped in a promising bit of low woodland along the DuPont Boulevard, a dried stalk in the roadside herbage attracted immediate attention. Investigation showed it to be not one of the recognized food plants of the group, and as the contained larva was not of that almost ubiquitous species, *cataphracta*, a vigorous search was begun for more. In half an hour, more than thirty infested branches had been gathered, and it was apparent that we were dealing with a species whose life history had been unrecorded, and which possibly was new to science. All this was done at very considerable expense to clothing and bodily comfort for the foodplant is that thorniest inhabitant of our woods, *Aralia spinosa*, which as a small tree along the edges of woods and in thickets bordering woodland streams, with its great frond-like leaves and immense flower-panicles, is a conspicuous feature of the flora of southern Delaware. We had too, the unique experience of gathering *Papaipema* larvae from high over our heads, instead of grubbing them out of root-stocks or the fleshy stems of perennial herbs. The tunnels of this insect, in the thick branches of *Aralia*, are of large diameter, beginning at or near the terminal bud and extending downward through the pithy annual growth, often into the older wood below; gummy exudations mixed with blackened frass mark the entrance to the burrow, and the terminal shoot usually dies and shrivels, a hanging cluster of dead leaves often further advertising its location; adventitious shoots from below the point of injury sometimes bear stunted flower-panicles.

In our breeding-cages, pupation occured more frequently in the larval burrows, rather than in the ground, and another trip was made in early September, in the full expectation that pupae would be found in abundance. Dozens of the typical burrows in the branches of *Aralia* were found, but not one of them contained either larva or pupa, and we were forced to conclude that under natural conditions pupation takes place in the soil, not in the branch of the foodplant. A tabulation of our eastern species of the genus, together with the large size of the *Aralia*-feeding larvae, indicated Dyar's *nephrasyntheta* as the probable identity of our find; but the emergence of the first moth showed that we had, not the anticipated *nephrasyntheta*, but an undescribed species. In this genus, where foodplant association has apparently been a prime factor in the differentiation of so many closely related species, a name derived from that of the foodplant is especially appropriate, and we therefore propose for this insect the name,

Papaipema araliae n. sp.

Head smooth on fons, antenna simple (minutely ciliate under magnific-

ation) with little sexual disparity and set in a tufting of whitish scales. Thoracic vestiture yellow overlaid by longer, purple-brown scales, the prominent anterior tuft has the long purple scales predominant, the yellow standing out strongly on the tegulae and dorsal area, here margined with purple.

Primary proportionately broad, of the typical maculation; the chrome yellow ground color is overlaid and much obscured with purple-or reddish-brown powderings, deepest on the veins and productive of a rather tawny effect. At the extreme base a dot of yellow or whitish scales, the basal spot is yellow, the basal line double, from which outwardly a yellow *dot* appears on the median vein; the basal area remaining appears as an irregular purplish band, bounded outwardly by the sinuous, double, antemedial line; the median field is evenly and entirely of one shade of yellow, upon which the powderings appear more dense in individual cases; the median shade line is prominently drawn in brown, angles at the lower corner of reniform and has a course thence straight to the inner margin, with a tendency to be denticulate between the veins. The orbicular is a rounded white spot, dotted or cut centrally with a few yellow scales; the claviform is composed of two smaller spots, with the upper minute and either white or stained with yellow, and the lower one pure white. The reniform is the usual combination of broken spots, mostly yellow but with some white appearing in varying degree. The post-medial line is double, excurved past the reniform, thence nearly straight to inner margin. Sub-terminal area glistening purplish, defined from the terminal space by the very denticulate sub-terminal line, and the latter area more yellowish especially at the apex where the bright yellow ground again shows. Fringes are lustrous purple-brown.

Secondary is of a much paler yellow, more or less suffused with a rosy flush, a faint median line and sub-terminal banding appearing in darker tone; the fringes paler than primary. The undersides of all wings are of similar hue to the secondary, a median line appears and stipplings of purple-brown are densest on costal margins. The abdomen is of same colour as secondaries, the usual tuftings appearing. Normal expanse, 38 to 45 mm.

The genitalic structures of the male conform to the conventional pattern, being similar to *marginidens* and others in detail. The trigonate, spinose area of the cost has the lower angle produced into a long point (called the pollex by Pierce) and this exceeds the curved, thorn-like harpe, which has the usual array of fine teeth posteriorly.

Five males and three females are under examination; one male type and One dwarfed example not fully typical. Emergence for the series, Sept. 24 to 30, 1920.

Type locality, Sussex County, Delaware.

The larval habit evidently conforms to the usual happenings in the genus; the hybernated egg doubtless gives up its larva the latter part of May, the growth proceeding as with allied species.

Larva. Penultimate stage: Belong to that section of the genus where the first four abdominal segments appear as a dark girdle, with the continuous dorsal and sub-dorsal lines broad and well defined in yellowish white, excpt where the latter are broken at the girdle, this species might be well selected as typifying what *Papaipema* attains in its best showing of tubercle arrangement and the attributes of its congeners.

Fully normal upon all points, its individuality is yet shown in the uniformity and large size of tubercle I on all abdominal segments. This is about three times the size of a spiracle and equals IV, ordinarily the largest general plate. On joint ten, the evanescent IVa becomes the largest lateral plate of the five here surrounding the spiracle. The anal plate is normal, brown.

Last stage: More of the early colouring is retained at this time than usual, the dull pinkish ground colour giving definition to the pale yellowish lines, which remain as before. Head shining brown, with blackish shade at ocelli; width, 3.25 mm. Body robust smooth, cylindric, livid; setae weak. Onjoint one the cervical shield is wider than head and is margined with black laterally. On joints four, five and six tubercle I is reduced; on ten the same arrangement holds as formerly, and all tubercles are indicated by blackish plates. The spiracle on joint eleven is not enlarged, as it is with the fern feeders. Lengths, 52 and 56 mm. for the stages respectively.

The pupa is correspondingly robust, shining brown and active; there is no frontal development and the cremaster consists of two separate and slightly divergent, curved hooks. The transformation is made in the ground after a rather lethargic resting period, the date of leaving the burrow being from Aug. 10 to 25, so far as could be determined.

A Tachinid fly claimed a large percentage of the observed larvæ, and doubtless is a regular check in this case, as with others. It seems to be, according to Dr. J. M. Aldrich, *Masicera seniles* Ms.

With the full evidence at hand there is no question as to the standing of this as a distinct species. There is, however, the question yet open as to what one of the species Guenee's type of *rutila* may finally fit in with. Drawings of that type indicate a narrow winged, yellow form, with brightly white stigmata, and there seems no fear of duplication in the case of *aralix*. Serial position near *merriccata* and *arctivorens* may be accorded it.

Our specimens of *araliae* were collected in the woodlands bordering the DuPont Bouvelard, beginning about two miles south of Ellendale, thence southward wherever the foodplant occurs in abundance, for a distance of about fifteen miles. The wide southern and western distribution of the foodplant (Pennsylvania to Florida and Texas) makes it probable that the associated insect may also prove to be a widely distributed species with a range possibly approximately that of the plant.

Explanation of Plate VI.

Fig. 1—*Papaipema araliae*, penultimate stage larva.
2—*Papaipema araliae*, mature larva.
3—*Papaipema araliae*, male.
4—*Papaipema araliae*, female.

A REVISION OF THE CANADIAN SPECIES OF THE AFFINIS GROUP OF THE GENUS TABANUS (DIPTERA).

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In connection with the preparation of a complete list of Canadian species of the genus *Tabanus* it became necessary to revise thoroughly the existing iden

*Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

tifications in the Canadian National Collection. It soon was evident that in the *affinis* group, which is essentially a northern one, there were a number of closely allied forms, capable apparently of separation on structural details of palpi, antennae, etc., which heretofore had been lumped under a single specific name.

In anticipation of a more extended work on the entire genus and with a view to clearing up the various nomenclatorial tangles in the group, I offer the following notes on the various Canadian species, accompanied by a key, based on a study of the structural characters of the females only. Owing to the relative scarcity of the males and the difficulty of definitely associating them with the correct females I am unable at the present time to give satisfactory characters for this sex. I have been in constant correspondence with Prof. Jas. Hine in regard to the correct application of many of our older names and I am pleased to state that in every instance we agree as to the species to which such names should be applied. Miss G. Ricardo has also compared for me a good deal of material with Walker's types in the British Museum and thus enabled me to definitely place several of his heretofore unrecognized species. To both these workers my hearty thanks is due. I am also greatly indebted to Mr. E. P. Vanduzee, San Francisco, Calif., Prof. A. L. Lovett, Corvallis, Oreg., Prof. R. A. Cooley, Bozeman, Mont. and Mr. J. B. Wallis, Winnipeg, Man. for loan of material.

The *affinis* group, as understood in the present paper, comprises those species in which the greater part of the first four abdominal segments is red or orange-red of various shades with a varyingly broad blackish dorsal band. The species extend across the entire northern half of the American continent reaching southward along the Atlantic Coast, down the Rocky Mountains and through the Cascades to the Sierra Nevada Mts. Further collection, especially in British Columbia will probably increase the number of known species; at the present time I am able to differentiate thirteen species.

Key to Species.

females.

1. Abdomen with 1st segment laterally orange or reddish.....2
   Abdomen with 1st segment laterally black.....12
2. Wings with all cross-veins distinctly clouded with brown .....*lasiophthalmus* Macq.
   Wings unclouded or with only bifurcation of third vein clouded.....3
3. Palpi thin, not swollen at base of 2nd joint.....4
   Palpi shorter, with base of 2nd joint noticeably thickened.....9
4. Subcallus normally denuded; front very broad.....*captonis* Mart.
   Subcallus normally not denuded.....5
5. Small species, 10 mm., very thin palpi, antennae with 3rd joint scarcely excavated basally.....*minusculus* Hine.
   Larger species, 14mm., or over.....6
6. Large species, 17-19mm; antennae with 3rd joint very strongly excavated basally 7
   Smaller species, 14-17mm; antennae only moderately excavated at base..8
7. Palpi deep orange-yellow; abdomen laterally deep orange-red..*affinis* Kby

Palpi paler; abdomen laterally yellow-brown.....*californicus* Mart.

8. Palpi long and thin, deep orange; length 14-15mm.; basal portion of third antennal joint chunky.....*trepidus*, McD.
   Palpi shorter and thicker, pale creamy; length 15-17mm.; basal portion of 3rd antennal joint rather slender.....*haemaphorus* Mart.
9. Subcallus normally denuded; palpi chunky, pale creamy.....*nudus* McD.
   Subcallus not normally denuded.....10
10. Antennae red with third joint moderately excavated; front narrow and coarctate; palpi moderately swollen.....*epistates* O. S.
    Antennae black with 3rd joint narrow and not noticeably excavated; front moderately broad; anterior branch of vein 3 frequently with basal stump 11
11. Wings with bifurcation of 3rd vein clouded with brown...*sonomensis* O. S.
    Wings with no cloud on bifurcation of third vein.....*phaenops* O. S.
12. Subcallus denuded, small species, 13mm.....*rupestris* McD.
    Subcallus not denuded, larger species, 16mm.....*atrobasis* McD.

Tabanus affinis Kirby. This is the largest species in the group and apart from size is best recognized by its long thin palpi of a deep orange color and the strong dorsal excavation at the base of the third antennal joint. It extends completely across the Dominion of Canada and in the East at least is not liable to be confused with any other species. In British Columbia it is rather rare and the following species, as well as *haemaphorus* Mart., have masquaraded under this name. According to Miss Ricardo triligatus Walk. is a sure synonym.

Tabanus californicus Marten. This name has been sunk as a synonym of *epistates* O. S. by Hine (1904, Ohio Nat. V, 236). Marten's types are unfortunately not in existence but on account of the size mentioned in the original description (17mm.) and the fact that it is very doubtful if the true *epistates* occurs as far south as California, I am inclined to associate this name with a large Pacific Coast form closely allied structurally with *affinis* but differing very decidedly in the lateral coloration of the abdomen. In *affinis* the color is a rather rich orange-red whilst in the present species it is yellow-brown, shaded with lighter yellow along the segmental margins. I have seen two specimens from Oregon and the Canadian National Collection contains a series of six females taken by Dr. S. Hadwen at Mt. Lehman in the Lower Fraser Valley, B. C. Marten's original description particularly mentions this yellow-brown color and the remainder of his description fits in so satisfactorily with the present species that I have adopted the name without much hesitation.

Tabanus haemorphorus Marten. Hine has sunk this name as a synonym of *sonomensis* O. S. but I cannot accept this. The true *sonomensis* is a comparatively small species, whereas the size of *haemaphorus* is given by Marten as 16-18mm. What I consider to be this species has been generally passing under the name of *affinis* Kby. It is apparently the commonest British Columbia species, occurring in May and June and differs from the true *affinis* in the shorter and paler colored palpi and the less excised 3rd antennal joint; it is also somewhat more slender in build. Besides the British Columbia series in the National Collection I have seen specimens from Oregon.

Tabanus captonis Marten. I agree with Hine's identification of this species,

with *comastes* Will. as a synonym. As stated (1904, Ohio Nat. V, 235) the species is readily separated by its wide front and denuded subcallus.

The species is quite common on Vancouver Island and on the mainland of British Columbia in the Lower Fraser Valley.

Tabanus lasiophthalmus Macquart. This is the only species of the group in which all the cross-veins of the wings are decidedly tinged with brown, which renders identification quite easy; other features are the denuded subcallus and the presence of pale yellowish oblique stripes laterally on the reddish areas of abdomen. It is just possible that occasional specimens occur in which the usual maculation of the wings is absent; one or two specimens before me which lack such maculation seem in all other respects to agree with normal specimens of *lasiophthalmus*. The species extends across the entire continent.

Tabanus trepidus, sp. nov. ♀. Palpi long, thin, not swollen at base and tapering to a fine point, deep yellow-orange, rather heavily clothed with black hairs; antennae reddish, the dorsal and terminal portion of 3rd. segment blackish; 3rd segment rather chunky and only moderately excised dorsally at base; subcallus not denuded; front dull yellowish, moderately broad with callosity and a spindle shaped patch above it shiny black; thorax dull blackish with the usual pale obsolescent stripes and the antealer tubercles slightly tinged with reddish; abdomen much as in lasiophthalmus with lateral areas of first four segments broadly reddish-orange, with distinct traces of pale oblique yellow stripes, and with a black dorsal band, widest on 1st segment; ventrally yellow-orange, more or less shaded with smoky, terminal segments blackish; legs blackish, the proximal half of all tibiae tinged with orange-yellow; wings dull hyaline, costal cell and area surrounding longitudinal veins in basal half of wing tinged with brown.

Length 14-15mm.

Holotype. 1♀, Ottawa, Ont. (June 26th., W. Metcalfe) in Canadian National Collection.

Paratypes. Numerous ♀'s from Shelburne, N. S. (July 1st., A. Gibson); Harcourt, N. B.; Ottawa, Ont.; Ft. Coulonge, Que.; Aweme, Man. and Peachland, B. C., in Canadian National Collection.

The species has been frequently confused with *epistates* O. S., but can at once be differentiated by the long thin palpi; from *affinis* it differs in its smaller size and less excavated third joint of the antennae.

Tabanus minusculus Hine. A single specimen of this small species is in the Canadian National Collection, kindly identified for me by Prof. J. Hine; it was captured at Ottawa, (Mer bleue, 26th., June, 1904) by Mr. W. Metcalfe. The palpi are extremely thin and the antennae show scarcely any excision of the basal portion of the 3rd joint. The subcallus is covered with a fine ochreous pollen and the callosity is brownish, extending up the front as a thin black line to the ocelligerous tubercle which is also brown.

Tabanus epistates O. S. Several species have been confused under this name which would account for Hine's statement in his paper on Western Tabanidae (1904, Ohio Nat. V, 236). Osten Sacken's characterization is so clear, however, as to leave no doubt in any mind as to the species to which the name should be applied. The narrow coarctate front is quite characteristic; the palpi are moderately long, pale ochreous and distinctly swollen at the base, the subcallus

is not denuded and the antennae are generally almost entirely red with base of 3rd joint rather chunky and moderately excised. The pale oblique stripes on the abdomen, noted in *lasiophthalmus* and allied species, are not present in *epistates*. The species appears to be common throughout Manitoba Saskatchewan, and the Hudson Bay region, rather rare in Ontario, Quebec and New Brunswick and decidedly rare in British Columbia; the only two specimens from this latter region which I should incline to place under this name were captured at Vernon and Cranbrook; both are rather larger than normal and have the antennae more suffused with black than is generally the case.

Tabanus nudus, sp. nov. This species has been so generally confused with *epistates* that a comparative description, indicating the points of distinction, is all that is necessary. The front is distinctly broader and the subcallus is denuded; the palpi are shorter and basally more swollen; the antennae are blacker apically, the basal portion of the 3rd joint is rather wider and the finger-like dorsal projection of the 2nd joint is much longer. The pale yellow lateral oblique stripes on the abdomen are present and only slightly less distinct than in *lasiophthalmus*. Length 15mm.

Holotype. 1♀, Ottawa (Mer bleue, June 1st., 1908), in Canadian National Collection.

Paratypes. Numerous ♀'s from New Brunswick (Fredericton, St. Stephen); Ontario, (Ottawa, Hastings Co.,); Manitoba, (Aweme); Saskatchewan and British Columbia. (Mt. Lehman).

The species is much commoner and more wide-spread than *epistates*.

Tabanus sonomensis O. S. The true *sonomensis* is a rather small species, confined, as far as I know, entirely to the Pacific Coast region. The British Columbia records I possess for the species are all from Vancouver Island but it probably will be found in the Lower Fraser Valley as well. Apart from its smaller size it may be distinguished from the preceding species by the entirely black antennae with a narrow thirdjoint, scarcely excised at base. There is a decided tendency towards a stump at the base of the anterior branch of the 3rd vein, the cross-vein being generally decidedly tinged with brown. Hine (1904, Ohio Nat. V, 244) has treated several forms under the name *sonomensis* but his remarks in the first paragraph are applicable to the true species.

Tabanus phaenops O. S. The species is very closely allied to the preceding and I have not yet decided to my entire satisfaction whether the two can go definitely separated. Typical phaenops possesses almost blackish palpi in contradistinction to the pale ochreous ones of *sonomensis* but this character seems variable; Oregon specimens and ones from Laggan, Alta., which agree in other respects, have pale palpi. The lack of the brown spot on the cross-vein seems more characteristic and for the present I am using this feature to separate the two forms. The antennae are similar to those of *sonomensis* and the reddish area of the abdomen seems variable in its extent. The species is decidedly rare in Canada and more material will be necessary to definitely decide its status.

Tabanus rupestris, sp. nov. ♀. Palpi moderately long, very little swollen at base, dull orange, at times considerably tinged with smoky; antennae thin, reddish, the distal half of 3rd joint black, very slight excavation dorsally at base of 3rd joint; subcallus denuded, shiny black; callosity shiny black with wedge-shaped black patch above it; front with yellowish pollen and black ocelligerous tubercle;

thorax blackish with the usual faint, pale lines; antealar tubercle black; abdomen dorsally with 1st segment almost entirely black, slight traces of orange being visible on the extreme lateral posterior area; a broad (2mm.) black dorsal band crosses segments II-IV, the lateral areas being deep orange-red, remaining segments black; slight traces of a paler flesh-colored oblique stripe on the red area of segment II; ventrally orange-red the posterior border of the 1st segment and the last three segments blackish; legs with all femora black, anterior tibiae tinged with orange proximally, other tibiae entirely dull orange; wings hyaline with costal cell brownish and a faint brown cloud at the base of the anterior branch of 3rd vein. Length 14mm.

Holotype. 1♀, Gallatin Co., Montana (July 14th., 7500 ft) in Canadian National Collection.

Paratypes. 2♀'s, Gallatin Co., Montana (July 27th., 5500 ft.) in Collection of Montana Agr. Coll.; Cowley, Alta. (Sept., R. N. Chrystal) in Canadian National Collection.

The species closely resembles *phaenops* but differs in the denuded subcallus, the redder antennae, the broader black area on 1st abdominal segment and the cloud on the outer cross-vein; none of the specimens before me shows any trace of a stump at the base of the anterior branch of vein 3 as is so often seen in phaenops; the extent of the black area on the first segment may be variable and should not be too much relied on as a sole means of separation from *phaenops*.

Tabanus atrobasis, sp. nov. ♀. Palpi orange, heavily clothed with short black hair, not swollen at base; antennae black with 2nd joint and basal portion of 3rd red; dorsal angle at base of 3rd joint obtuse, with little excavation, this whole portion being rather slender; subcallus and front covered with pale yellowish pollen, latter moderately (.5-.75mm.) broad with shiny black-brown callosity extended towards as usual by a fine black line; thorax blackish with the five pale lines as usual and a black antealar tubercle; abdomen with first segment dorsally entirely black except a very narrow line of orange along posterior margin; second to fourth segments laterally orange, shaped somewhat with brownish; a broad (2mm.), black, dorsal band with more or less distinct central row of triangular pale spots situated on rear margin of segments and clothed with pale yellowish hair; last three segments blackish; rear margins of all segments with yellow hair; ventrally dull orange, shaded with smoky and with rear segments entirely black. Legs black, anterior tibiae slightly, other tibiae almost entirely dull-orange.

Length 16-17 mm.

Holotype. 1♀, Mt. Lehman, B. C. (May 30th., S. Hadwen) in Canadian National Collection.

Paratypes. Numerous ♀'s from various B. C. localities (Mt. Lehman, Victoria, Duncan, Courtenay, Royal Oak) in Canadian National Collection.

The species has apparently been confused with both *sonomensis* and *captonis;* the entirely black first abdominal segment seems quite characteristic and separates *atrobasis* from both the above mentioned forms; it is considerably larger than *sonomensis* and lacks the denuded subcallus and chunky third antennal joint of *captonis*. The species extends south into Oregon, a number of specimens having been received from Prof. Lovett, labelled either *sonomensis* or *epistates*.

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POPULAR AND PRACTICAL ENTOMOLOGY.

COLLECTING ABOUT WALDEN POND.

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Concord, Mass., will always be holy ground to philosophers and naturalists. Here lived and worked and here lie buried the members of that great school of thinkers and writers who will always maintain their distinctive place in American letters—Emerson, Thoreau, Alcott, Miss Alcott, Hawthorn, Sanborn and others.

In all the town, however, the one spot that attracts naturalists most is that called "Thoreau's cairn," situated on the edge of Walden Pond, where, as his biographer Sanborn remarks, "Thoreau spent one of his lives." The exact location of Thoreau's cairn is now marked by a pile of ordinary field stones which grows larger from year to year, as it is the custom for each visitor to add one stone to this monument. No memorial that man could build would be more appropriate in marking the spot where Thoreau made his innumerable observations of nature and where "Walden" must have been conceived. It is especially satisfying to each visitor to know that he has personally added his mite to the monument called "Thoreau's cairn."

Should Thoreau return to Walden today he would find it much different from the beautiful, quiet New England lake that he knew. On one side of it now runs a railroad that he saw in course of construction and trains roar by, from time to time; on the other side automobiles race by on a perfect State road. The shouts of bathers disturb the quiet until far into the Summer night. The forests have nearly all been cut over; at times fires rage through the woods about the pond, and the chestnuts that have escaped the scourge of fire are rapidly dying from the attack of the chestnut bark disease. Young pines are destroyed or deformed by the work of the white pine weevil and gipsy moth larvae defoliate the trees generally. A few stately pines still remain, however, perhaps the only living things that were once Thoreau's associates at Walden.

For two years past, Walden Pond has been one of the chief collecting grounds of the writer. Happy the day, when it has been possible to spend a few hours in the open there. At all seasons interesting material is to be found; in Winter and Spring under the bark of dead trees, in logs and stumps, and under stones; during Summer and Fall by beating foliage with a net.

In the early Spring, Elaterids are numerous in rotting stumps and logs. Such interesting species as *Alaus myops* (Fab.), *Adelocera discoidea* (Web.), and *brevicornis* Lec., *Elater luteus* Say, and *nigricollis* Hbst., and *Corymbites hieroglyphicus* (Say) being among the most showy, together with many others. Cucujids are to be found beneath the dead bark of trees in some numbers, including the showy *Cucujus clavipes* Fab. and the sombre colored *Brontes dubius* Fab. Fungus beetles of considerable variety, together with other species of

beetles whose habitat is dead logs and stumps, are numerous. The beautiful *Aphorista vittata* (Fab.) is occasionally found, *Eustrophinus bicolor* Fab., *Orchesia castanea* Melsh. and *Holostrophus bifasciatus* (Say) are numerous, while *Scaphidium piceum* Melsh. and *Scaphisoma convexum* Say are less so.

Somewhat later *Microtonus sericans* Lec. *Canifa pusilla* (Hald.), *Capnochroa fulginosa* (Melsh.), *Aphorista vittata* (Fab.), *Mycetophagus flexuosus* Say, *Litargus didesmus* Say and *Lathridius liratus* Lec. are among the interesting species that can be found either under bark or by sweeping. Throughout the Summer Chrysomelids are numerous, including species of such striking groups as *Pachybrachys* and *Cryptocephalus* and species of *Donacia*. *Calosoma sycophanta* L. can be found climbing in search of Gipsy moth larvae.

Representatives of the Hemipterous groups are common during the Summer and a considerable number of species occur. Among the *Pentatomidae*, there may be mentioned such interesting species as *Podisus placidus* Uhl., *Perillus exaphus* Say, *Banasa dimidiata* (Say), and *Peribalus limbolarius* Stal., while *Euschistus* is represented by several species, *variolarius* (P.B.), *tristigmus* Say, and *ictericus* (Linn.).

Species of the very interesting Fulgorid genus *Oliocarus* are found occasionally, while late in the season *Acanalonia bivittata* Say is quite numerous. Throughout the Summer the Cercopids are plentiful, the innumerable forms of *Philaenus leucophthalmus* (Linn.) and *Clastoptera proteus* Fitch and *obtusa* (Say) being most numerous.

Leafhoppers are numerous in species and individuals, some of the most showy being *Eutettix southwicki* (Van D.), *johnsoni* Van D., *seminudus* (Say), and *strobi* Fitch; *Jassus olitorius* Say, *Chlorotettix unicolor* (Fitch) and *tergatus* (Fitch), *Penthimia americana* Fitch, *Mesamia vitelina* (Fitch), and *Acocephalus nervosus* (Schrank).

Everything considered, Walden Pond has proved to be one of the most favorable collecting grounds that the writer has found near Boston, and a visit to these sacred haunts has yet to be made without turning up something interesting or not previously taken.

These specimens labeled "Concord" seem a little more valuable than others, perhaps for the reason that Thoreau may have observed and wondered at the means of life of the forbears of these specimens which now repose in my cabinet; even as we today wonder and search to learn how and why they live, so that in far future years our posterity may more clearly understand and appreciate that greatest riddle of all—life.

NOTES ON THE INSECTS OF THE SPREADING DOGBANE, APOCYNUM ANDROSAEMIFOLIUM L., WITH A DESCRIPTION OF A NEW DOGBANE MIDGE, BY DR. E. P. FELT.

BY HARRY B. WEISS AND ERDMAN WEST,
New Brunswick, N. J.

The following notes are the results of miscellaneous observation, made for the most part on *Chrysochus auratus* during the summer of 1920. In addition it was thought desirable to add brief accounts of other dogbane insects

and to indicate the important references dealing with such species and their life histories. We are very grateful to the specialists whose names are mentioned in the text, for identifications and other help. In the description of the larva of *Chrysochus auratus*, we have followed the form suggested by Mr. F. C. Craighead and Dr. Adam Boving, who have done noteworthy work in this field and to whom our sincere thanks are due for generous help and advice with this and other larval descriptions.

The spreading dogbane *Apocynum androsaemifolium* L., is a perennial herb, fairly common and well distributed. In New Jersey it flowers from mid June to late July or into August and may be found in large and small patches along roadsides, in fields and neglected orchards, etc. The following are the accounts of insects more or less closely associated with this plant.

Chrysochus auratus Fab. (Coleop.)

This species known as the gold gilt or goldsmith beetle is well known as a feeder on dogbane. It has also been recorded as feeding on milkweed (Blatchley, Col. Ind., p. 1141; Smith, Ins. N.J., p. 344) and other plants. Newell and Smith (Bul. 52, U.S. Bur. Ent., p. 70) state that in northern Georgia the beetle did much damage in a small pecan grove by defoliating the trees. Felt (16th Rept. Bul. N. Y. St. Mus., vol. VII., No. 36) says that it lives by preference on dogbane and though there are accounts of the beetle attacking other plants, they are probably erroneous or the insects may have been driven by hunger to feed on plants otherwise unmolested. In New Jersey we have found it confined almost exclusively to dogbane and occasionally on milkweed.

The beetles can be found from the last of May until almost to the middle of August, feeding usually on the edges of the leaves and consuming all of the tissue, thus entirely destroying the natural outlines. Egg laying takes place over a long period, it being possible to find unhatched eggs as late as the first of August. Most of them, however, hatch during July. The eggs are deposited in groups of two and three, being laid on their sides, usually on the under surface of a leaf near the edge and covered with a little cone of excrement. Sometimes they are found on the stems of the plants or on fence posts, etc., close to infested plants. Zabriskie (Jour. N. Y. Ent. Soc., vol iii., p. 192) states that the egg capsules measure about 3 mm. long by 2 mm. high and are composed of brown and black pellets moulded in a conical or irregular ovoid form. Under the microscope, the macerated and crushed material shows no particular structure, but spores of saprophytic fungi and minute grains of sand are frequently present. Zabriskie also states that he discovered a beetle ovipositing in the opening at the summit of a cone and that in the crater of the cone was an egg, evidently just deposited. Considering the fact that the eggs are elongate and laid on their sides on the leaf, it does not seem possible that they could be easily placed in such a position after the cone was formed. In the field cones with open craters were always found to be empty or to contain empty egg shells. From this, it seems reasonable to assume that the cone is built over the eggs after they have been laid and that Zabriskie probably observed a cone before it had been entirely completed.

After hatching, the larva eats through the capsule at or near the small end and drops to the ground which it enters. Later, it can be found on the roots.

By the middle and last of October, all sizes of larvae except small ones can be found on the roots. Some are apparently full grown at this time. They are best located by taking the top soil off and exposing the upper surfaces of the root stocks. After the stocks have been followed out and laid bare for several feet from the base of the plant, they should be cut in sections and carefully lifted up. When larvae are present, they will be found in the soil directly under the injured portions of the roots. Most of the larvae are found feeding on the lower surface of the root stock from four to twelve inches away from the base of the plant. Irregular, longitudinal channels are eaten in the lower side of the root, everything except the central woody portion being consumed. Sometimes the channels extend part way on the upper root surface. From the fact that diggings made as late as November revealed full and partly grown larvae, it appears that pupation takes place in the spring or early summer.

Egg.. Length 1.5 mm. Greatest width, 0.58 mm. Whitish, elongate, subelliptical, sides slightly arcuate; obtusely rounded at both ends, one end slightly broader than the other; chorion apparently smooth.

Full Grown Larva. Length about 12 mm. Width about 3.5 mm. Form cylindrical, slightly curved, lightly chitinized, creamy white. Head subcircular, flat, depressed; collum absent; occipital foramen subtriangular; epicranial halves separated dorsally by a faint median suture; front flat; gula indistinct, membraneous; ventral mouth parts fleshy and slightly retracted; maxillary sclerite absent; clypeus narrow, transverse; labrum oval, anterior edge arcuate and bearing several minute hairs; antennae laterally inserted, two jointed, supplementary joint not as wide but almost as long as apical joint; ocelli absent; mandibles biting type without molar structure, bifid at apex; maxilla fused with labium to near its apex; maxillary palpi four jointed including palpifer; lacinia inserted below palpifer, short, finger-shaped, rounded at apex, bearing several chitinous hairs on apex and inner surface; galea absent; cardo triangular, of one piece, chitinized; labium with mentum and submentum fused and indistinct; labial stipes ring-like, labial palpi one jointed. Protergum twice as wide as long bearing lightly chitinized plate. Meso and metatergum each bearing three hair bearing processes. Pre and postepipleuron well developed, both bearing setose lobes. Hypopleural chitinizations of thorax faintly indicated. Coxae widely separated. Legs weak, slender, bearing several hairs, five-jointed, tarsus long, slender, claw-like. Epipleura and hypopleura slightly produced bearing setose lobes. Abdominal segments transversely ridged dorsally, each ridge bearing a row of hairs; coxal lobe with pronounced ambulatory tubercles with long setae; ninth abdominal segment without cerci; tenth segment terminal, wart-like, composed of three anal lobes, two lateral, chitinized and one dorsal; anal opening longitudinal; median ventral portion of each abdominal segment bearing numerous minute hairs. Spiracles annuliform, thoracic on anterior margin of mesothorax.

The adult was described by Fabricius in 1775 (Ent. Syst. 101) and later mentioned in various lists and publications.

Lasioptera apocyni Felt (Dip.)

At New Brunswick, N.J., on August 1, numerous oval, depressed stem discolorations were observed in a patch of dogbane. Closer observation showed

empty, dipterous pupal cases projecting from these areas and narrow oval cells beneath the infested parts of the stems. Most of the discolorations were on the lower half of the stem and many were only five or six inches above the ground. Practically all of the adults had emerged when the infestation was noted, but on August 6 an adult was secured and sent to Dr. Felt, who found that it represented a new species. He very kindly drew up the following account and description which is published with his permission.

"Lasioptera apocyni n. sp.

This one midge reared was received under date of August 9, 1920, from H. B. Weiss, Trenton, N.J., accompanied by the statement that the insect had been reared from dogbane, *Apocynum androsaemifolium*.. The specimen was labeled 'New Brunswick, N.J., from stems of dogbane, August 6, 1920.' This species approaches *L. inustorum* Felt from which it may be easily distinguished by its smaller size and different coloration.

Gall.. The gall is an irregularly oval, dull reddish orange stem discoloration with a length of 1 cm. and a diameter of .3 cm. Narrowly oval cells may be found just beneath the surface of the affected parts of the stem.

Female. Length 1mm. Antennae hardly reaching to the base of the abdomen, sparsely haired, dark brown, 21 segments, the 5th with a length about three-fourths its diameter, terminal segment somewhat produced with a length one-fourth greater than its diameter, the tip broadly rounded. Palpi, first segment short, subquadrate, the second with a length nearly twice its diameter, the third one-fourth longer than the second, more slender, and the fourth a little longer and more slender than the third. Mesonotum dark reddish brown, scutellum and post scutellum reddish brown. Abdomen dark brown, the segments narrowly margined posteriorly with white scales. Ovipositor with a length about half that of the abdomen, the basal portion moderately long, the lobes narrowly oval, with a length three times the width, sparsely haired; wings hyaline, the discal spot small and at the basal half. Halteres whitish transparent, yellowish orange basally. Coxae and base of femora dull yellowish orange, the distal portion of femora, tibiae and tarsi apparently a nearly uniform dark brown. Claws rather long, slender, unidentate. Type A 3141 N. Y. State Museum."

On August 10, a parasite was bred from the infested stems, which was identified by Mr. S. A. Rohwer, through the courtesy of Dr. L. O. Howard, as a species of *Tetrastichus*.

Ammalo tenera Hubner (Lep.)

This is one of the tiger moths and a common species in the Atlantic States, the larva feeding on the foliage of dogbane. In the northern and middle sections of New Jersey, the moths are most plentiful in the vicinity of dogbane about the middle of June, at which time eggs are deposited. The larvae feed during the night or at dusk and hide by day at the bases of the plants. Under the name *Euchaetes collaris* Fitch, various references are given to this species by Edwards (Bul. 35, U. S. Nat. Mus.). Among these, Jewett (Can. Ent., vol. xii., p. 228, 1880) states that at Dayton, Ohio, the larva fed on *Asclepias incarnata* and refused *A. cornuti*, while Van Wagener (Can. Ent., vol ix., pp. 170-171, 1877) gives dogbane as the food plant, stating that the larvae will in confinement feed on *Asclepias*, but that he never found but one larva on *Asclepias* in the

field and this after careful search. He also states that they are solitary feeders and that they leave their food plant during the day and hide. Jewett (loc. cit.) states that there are from three to four broods a year, each one requiring from 37 to 39 days, the fall brood hibernating as pupae.

Jewett (loc. cit.) describes the egg and Van Wagenen (loc. cit.) gives a description of the larva, which was drawn up for him by Lintner. Edwards (Papilio, vol. iii., pp. 145-8, 1883) under the name *E. collaris* gives brief descriptions of the larvae after each moult, beginning with the second. The adult was described by Hubner in 1818 (Zutr. exot. Schmett., i. 7, f. 3, 4,). Barnes and McDunnough in their Check List of Lep. of Bor. Amer., 1917, give *collaris* Fitch and *antica* Wlk. as synonyms.

Haemorrhagia diffinis Boisd. (Lep.)

Under the generic name *Hemaris,* Edwards (Bul. 35, U. S. Nat. Mus.) lists dogbane as a food plant of this species and gives several references to the larva. Mead (Can. Ent., vol. ii., p. 157) gives a brief description of the larva and lists snowberry as the food plant. Lintner (24th Rept. N. Y. St. Mus. Nat. His., pp. 109-11, 1870) gives a description of the larva and cocoon and states that the larva was taken on bush honeysuckle *Diervilla trifida.* We have not noted this insect on dogbane in New Jersey, although Smith (Ins. N. J., p. 425) records it as not rare, larva on *Apocynum* and *Symphoricarpus.*

Pyrausta futilalis Led. (Lep.)

On several different occasions, the yellowish, black spotted larvae of this species were abundant on dogbane, notably at New Brunswick, N.J., July 25, Oct. 2, and Princeton Junction, N.J., July 28. They were found in colonies webbing up the foliage and tips, feeding thereon and destroying everything except the larger veins of some leaves. They hide by day in the curled up partly eaten leaves and feed at dusk and during the night. At the approach of cool weather, larvae under observation constructed rather loosely built cocoons within curled and pulled-together partly eaten leaves. Dormant larvae were found in such situations in November, and from this it appears that pupation may occur in the spring. Most of the larvae under observation were parasitized. The adult was described in 1863 by Lederer (Wien. ent. Mon., vii., 467). Dyar in his Check List (Bul. 52, U. S. Nat. Mus.) gives *erectalis* Grote as a synonym and the distribution as the Atlantic States.

A good account of this species by Dr. E. P. Felt is found in Lintner's 11th Report on the Injurious and Other Insects of the State of New York (49th Rept. N. Y. St. Mus., 1896, pp 138-142). This paper includes notes on the habits of the larvae, descriptions of the larval stages, number of generations, etc., together with a bibliography of the literature up to 1896.

Miscellaneous Species Found Associated With Dogbane.

Very little opportunity was afforded to collect the insect visitors and the following list is recognized as woefully incomplete.

Homoptera.

Aphis asclepiadis Fitch. New Brunswick, N.J., June 14, on leaves and stems. (det. C. P. Gillette).

HEMIPTERA.

Lopidea confluenta Say. Monmouth Jc., N.J., July 14, on leaves. (det. H. G. Barber).

Poecilocystus basalis Reut. New Brunswick, N.J., July 4, on leaves.

COLEOPTERA.

Typophorus canellus Fab. var. *aterrimus* Oliv. Monmouth Jc., N.J., July 14, on leaves. (det. C. A. Frost).

Monachus ater Hald. Monmouth Jc., N.J., July 14, on leaves. (det. C. A. Frost).

Chauliognathus marginatus Fab. New Brunswick, N.J., June 26, at flowers.

Nodonota puncticollis Say. New Brunswick, N.J., June 26, feeding on leaves. (det. C. A. Frost).

LEPIDOPTERA.

Ammalo tenera Hbn. Monmouth Jc., N.J., June 15, resting on leaves. (det. F. E. Watson).

Ectypia clio Pack. Under the name *Scirarctia clio*, Dr. H. Behr (Papilio, vol. 2, p. 187) records the occurrence of this species on *Apocynum androsaemifolium* in the larval stage and the rearing of several moths from larvae collected before May 20. On May 20 a cocoon was started and on July 12 adults were secured.

Archips rosaceana Harr. Elizabeth, N.J., August 4, larvae feeding at tips of leaves.

Tortrix clemensiana Fernald. Bound Brook, N.J., pupa taken from rolled up leaf. (det. A. Busck).

Eulia velutinana Walker. Bound Brook, N.J., Sept. 7. Bred from larva found in August webbing up several leaves and feeding therein. (det. A. Busck).

Poanes massasoit Scud. Monmouth Jc., N.J., July 14, visiting flowers. (det. F. E. Watson).

DIPTERA.

Chrysomyia macellaria Fab. New Brunswick, N.J., July 4, visiting flowers. (det. J. R. Malloch).

Lucilia sylvarum Mg. New Brunswick, N.J., July 4, visiting flowers. (det. J. R. Malloch).

Mr. Raymond C. Osburn writing in the Ohio Journal of Science (vol. xx., No. 7, May, 1920, under the title "The Syrphid Fly, *Mesogramma marginata* and the Flowers of Apocynum," gives an interesting account of his observations on the relation between the flowers of dogbane and their insect visitors, special attention being paid to *M. marginata* Say, of which numerous specimens were noted as having been captured, each being held fast by the proboscis. Mr. Osburn states that some of the flies were not held between the edges of the anthers, but were stuck fast on the outer surface of the anther, and in one case on the inner surface of the corolla. He also calls attention to a hitherto neglected factor in the process of entrapment, namely the adhesive nectar. Mesogrammas coming to a flower cluster were noted as entering and emerging without difficulty several times, but upon watching individual flies it was found that they were eventually caught. Mr. Osburn explains this by saying that the flies are not held until the proboscis becomes sufficiently gummed-up with the

sticky secretion. In the same paper will be found a list of flower visitors not caught and summaries of other papers dealing with *Apocynum* insect visitors.

A REVISION OF SYRPHUS SPECIES BELONGING TO THE RIBESII GROUP (DIPT.)

BY C. HOWARD CURRAN,
Orillia, Ontario.

With the recognition of three European species of Syrphus in Canada, viz. *S. vitripennis* Meig., *nitidicollis* Meig., and *ochrostomus* Zett., and the discovery of some species which are evidently undescribed, the need of a revised synopsis of those species with the disc of the thoracal squamæ hairy seems desirable. Several of the species are very closely related and often separable only after considerable study. Without going into minute detail, the author hopes, by means of the present paper, to render the identification of the various species less difficult than it is at present owing to the scattered nature of the descriptions.

The chief characteristics of the members of this group lie in the presence of three principal yellow or reddish yellow abdominal bands, the first of which is interrupted, the two following entire, and reaching the lateral margins of the segments, except in *S. opinator* O.S. Nine species have the squamæ pilose above and eight bare, although if *S. insolitus* Osb., which belongs to this group, is included, nine species belong to each section.

Syrphus xanthostomus Will., recognized from *S. grossulariae* by its yellow antennæ and yellow scutellar pile and *S. insolitus*, which has a black face, are not dealt with in this paper.

Table of Species.

1. Disc of thoracal squamæ hairy 2
   Disc of thoracal squamæ pilose 14
2. Eyes pilose ... ... ♂ ♀ *torvus* O.S.
   Eyes bare 3
3. Hind femora of female black at base ... ... ♀ *vitripennis* Mg.
   Hind femora of female yellow at base 4
4. Second and third bands do not reach abdominal margins. ♂ ♀ *opinator* O.S.
   Second and third bands reach margins 5
5. Abdominal bands extend over margins in their full width; legs bright yellow except dark band on hind femora; middle basitarsi with all yellow small spines below. 11-12mm. ... ... ♂♀ *knabi* Shannon
   Bands usually attenuated laterally; middle basitarsi with black spines below 6
6. Hind femora black at base 11
   Hind femora yellow at base 7
7. Femora wholly yellow in both sexes; antennae reddish; cheeks often narrowly blackish below the eyes ... ... ♂ ♀ *protritus* O.S.
   Femora not wholly yellow; antennæ chiefly blackish 8
8. Abdomen with the sides strongly reflexed downwards; apical segments all visible from above ... ... ♀ *transversalis* n. sp.

Abdomen not so shaped 9

9. Face with a median brownish or blackish stripe; femora of hind legs with brownish band; venter with alternate black and yellow bands ... ... ♀ *ribesii vittafrons* Shan.

Face with median dark stripe 10

10. Venter unicolorous; abdominal bands not much attenuated laterally and seldom notched posteriorly; the spots on the second segment reach the margin in almost the full width of one spot; smaller, seldom over 9 mm. ... ... ♀ *rectus* O.S.

Venter usually with alternate yellow and black bands, but these sometimes very faint or represented by isolated spots; spots on second segment reach the margin in not more than half the width of the spot; abdominal bands always distinctly notched posteriorly and attenuated laterally .. .. ♀ *ribesii* L.

11. Antennæ red; hind femora with about the apical third yellow; tiny black bristles on end of femora sparse, sometimes they are almost all pale; hind tibiæ with a moderately narrow, more or less obscure postmedian band darker ... ... ♂ *vitripennis* Mg.

Flies without all these characters 12

12. Face with a median blackish or brownish stripe .. ♂ *ribesii vittafrons* Shan.

Face wholly yellow 13

13. Venter unicolorous; first band or spots reach the lateral margin of the segment in at least half the width of the spots; pile of vertex more tawny; fewer small black bristles on hind femora (about 9) ... ... ♂ *rectus* O.S.

Venter as in couplet 10-2; first abdominal band reaches the sides very narrowly; pile of vertex pale yellow (about 11 or 12 mm.) .. ♂ *ribesii* L.

14. Antennæ black; abdominal bands extended over side margins in their full width; eyes bare ... ... ♂ ♀ *grossulariae* Mg.

Antennæ more or less reddish 15

15. Eyes pilose; face with median black stripe ... ... ♀ *reflectipennis* n. sp.

Eyes bare; face sometimes with median black stripe 16

16. Face with median dark stripe 17

Face without median dark stripe; antennæ reddish 18

17. Female bands reach the margins in their full width; base and tip of hind femora yellow (Eastern species) ... ... ♀ *genualis* Will.

Female bands attenuated laterally and moderately biconvex posteriorly; hind femora yellow, with brownish band on apical half; male very similar to *S. rectus* (Western species) ... ... *rectoides* n. sp.

18. Scutellum yellow haired ... ... *ochrostomus* Zett.

Scutellum black haired ... ... *nitidicollis* Mg.

Note: *S. xanthostomus* Will. differs from *S. ochrostomus* in having the abdominal bands very wide and not at all metallic.

Verrall (Brit. Fl., vol. viii.) states that the venter of *S. ribesii* is usually unicolorous. I have an English specimen in which it is as described above; other Canadian specimens show very light markings, but I think there are always sufficient darker markings present to readily

distinguish the species from *S. rectus; S. knabi* and *ribesii vittafrons* show the character very strongly, as do most of the North American specimens which I have examined.

Syrphus protritus O. S.

Legs in both sexes wholly reddish yellow, the tarsi somewhat darker. Antennæ reddish. From *S. rectus* it is distinguished by the wholly yellow femora, reddish antennæ and posteriorly notched abdominal bands. There are fewer black bristles on the apical half of the hind femora than in *S. ribesii.*

Five specimens from Manitoba (Dr. A. J. Hunter) and one specimen, Orillia, Ontario (Curran).

Syrphus knabi Shannon.

A large and distinct species with bright yellow bands which extend over the margins in practically their full width, except in occasional males. Squamæ pilose above. Face wholly yellow. Legs reddish yellow, the hind femora in both sexes with a brown or blackish post median band. Middle basitarsi with wholly yellow bristles below, thus differing from all other species with pilose squamæ. Scutellum chiefly black haired. Sides of thorax distinctly yellowish. Length 11—12 mm.

A common species in Ontario, where the larvæ live upon aphids on elm (*Lanigera* sp. on *Ulmus*). I have found two and three larvæ in a single curled leaf. I have also specimens from Manitoba collected by Dr. A. J. Hunter at Winnipeg and Teulon. The species was originally described from Maryland and Virginia.

Syrphus ribesii L.

Large, 11 to 12 mm. Antennæ usually largely brownish, but sometimes mostly reddish. Abdominal venter usually with alternate yellow and blackish bands, sometimes obscure or represented by isolated spots. Legs in female mostly yellow, sometimes with an indistinct post median brownish band on posterior femora; legs of male black on basal third of front four femora, the hind femora black except the tip of apical sixth; hind femora on apical half are thickly black bristly and their tibiæ bear prominent black pile on the outer side. The bare eyes distinguish it at once from *S. torvus;* the black spines below the middle basitarsi from *S. knabi;* the darker antennæ and more numerous spines on femora as well as the more extensively black hind femora from *S. vitripennis;* the darker legs, antennæ and larger size from *S. protritus;* and the fasciate venter from *S. rectus.*

S. ribesii is not common in Ontario, although it is met with occasionally. In five years I have taken only eight specimens. It seems to be much more common in Manitoba, where Dr. Hunter captured some twelve specimens in September.

Syrphus ribesii vittafrons Shannon.

Very similar to the typical *ribesii* but with a median brownish facial stripe and the pile of the vertex more fulvous. The ventral abdominal markings are very distinct so this variety can hardly be confused with other species. The hind femora of the female always bear a brownish post median band. (Common, Ont., Man.)

Syrphus rectus O. S.

This species which has long been confused with *S. ribesii* is undoubtedly distinct, but specimens occur which can only be distinguished with certainty from that species by an examination of the genitalia, unless the characters I have indicated, viz. practically unicolorous venter, will apply to all specimens from various localities as it does to all I have examined. Another very good character for separating the two species lies in the more broadly yellow sides of the second abdominal segment in *rectus*. The more sparse tiny black bristles on the end of the hind femora, the distinct bluish metallic reflection of the thorax, as well as the more sparse pubescence of the scutellum are also important characters, but difficult to use except by a specialist. In most specimens of *S. ribesii* the venter bears the bands described, while in most specimens of *rectus* there are seldom even isolated spots in the male, and never in the female. I cannot satisfy myself that the spots on the venter of *S. rectus* males are really ventral spots, as they appear on the sides of the ventral segments and apparently are the darker bands of the dorsum seen through the venter, while in *ribesii* there are always spots in the middle of the segments. The hind femora of the female always bear a blackish post median band as in *ribesii vittafrons*, but in the typical *ribesii* the bands are never more than brownish. The face is wholly yellow and there is no spot below the eyes.

This is the most common species of the genus in Ontario. I have counted thirty-seven specimens on a single bloom of Elder, and during early July of last year a large field of Elder bushes had the blooms literally covered with specimens. In fact this was the only species present. While *Syrphus ribesii* has been frequently recorded and figured from Ontario, it seems that the majority of records refer to this present species. Hunter took twenty-five specimens at the Manitoba Agricultural College, Winnipeg, on August 17th and 21st, but I have only seen one specimen from Teulon (near Lake Winnipeg).

Syrphus transversalis, new species.

Sides of the abdomen strongly reflexed downwards beyond the second segment; otherwise moderately like *S. rectus*.

Length, 8 to 9 mm. Female. Face yellow, with white pile. Front black, black pilose, clothed with yellowish pollen in front of the ocelli, except for a large triangular, shining black area in the middle. Pile of the posterior orbits yellow; eyes bare. Antennæ yellow, tips of the first two segments and the upper quarter and end of the third segment, brown or black.

Thorax shining greenish black, with yellowish pile. Scutellum yellow, with black pile.

Abdomen opaque black; a pair of broadly separated triangular yellow spots on the middle of the second segment, their inner ends rounded, the outer ends extending narrowly forward along the sides to the base of the segment. Third segment with an entire, basal, straight, moderately broad yellow band, which reaches the margins in practically its full width. Band on fourth segment similar, but slightly narrower. Broad apex of fourth segment, and tips of following segments, yellowish. Pile on basal quarter and on the yellow bands, yellowish, elsewhere short, sub-appressed, black.

Legs yellow; hind femora with a broad blackish ring beyond the middle; a

broad preapical ring on the hind tibiae and the hind tarsi piceous. Legs with whitish pile, but the hind tibiae and tarsi black pilose.

Holotype, Female, Orillia Ont., June 26, 1914 (Curran) and two paratypes, same locality, in the author's collection.

The shape of the abdomen in living specimens is remarkable; the abdomen is rather broad, and truncate at the apex, and all the terminal segments are visible from above, due to the apex of the fifth segment being strongly curved upwards. The species is found in deep woods.

Syrphus vitripennis Meigen.

Habitat: Manitoba.

Length, 9mm. Male. Face yellow, with a bluish opalescence and whitish pile, except on the upper angles; tubercle, margin narrowly and the cheeks, more reddish; anterior tip of oral margin brown. Cheeks brownish below the eyes. Frontal triangle black, with a bluish reflection, its sides and apex moderately yellowish gray pollinose; entirely black pilose; above the antennæ the front is reddish yellow on the antennal prominence. Antennæ reddish; end of third joint evenly rounded. Posterior orbits wholly gray pollinose, with grayish pile below, yellowish above. Vertical triangle broader than in *ribesii* or *rectus;* wholly black pilose. Thorax greenish blue, very strongly metallic, with irregular dull cupreous areas; pleuræ blackish beneath the grayish pollen. A yellowish spot above the root of the wing. Postalar callosities piceous-black. Pile yellow; above the wings reddish; on the pleuræ more whitish. Scutellum yellow, scarcely shining, with sparse black pile except on the base and angles, where it is yellowish. Abdomen opaque black; tip of the second, apical half of third except the tip, and the following segments wholly shining. First segment obscurely reddish on the sides. Second segment with a pair of moderate sized, broadly separated yellow spots which are produced forward to the anterior margin; the black on the posterior half of the segment extends forward along the margin to beyond the middle of the segment. Second band moderately separated from the anterior margin of the segment, except at the sides where it reaches the antero-lateral angle. In front it is almost straight, with sometimes a small median yellow triangle extending forward; posteriorly it is biconvex and reaches the margin in over one-third its width. Third band similar. Tip of the fourth and the fifth segment except the base, reddish. Pile on basal one and one-half segments cinereous, on the yellow spots on the second segment, long, bright yellow; on the remaining yellow bands blackish medially, pallid laterally; elsewhere, rather long, black. Legs reddish-yellow; basal third of the fourth anterior and two-thirds of the posterior femora, an obscure band beyond the middle of the hind tibiæ and the hind tarsi brownish in the middle. Wings hyaline, the base, costal cell and stigma yellowish. Squamæ yellowish, pilose above, fringed with yellowish hairs. All the abdominal bands are somewhat reddish.

Female. Antennæ sometimes brownish above; arista brownish apically; front shining blackish above the antennæ, the reddish color more restricted; above this a moderately large triangular bronzed area which connects above with the shining greenish and bronzed upper third of the frons; pile entirely black. First pair of abdominal spots more oval; sides of first segment yellow;

fifth segment with yellow triangles at anterior angles; pile slightly shorter throughout; cheeks without distinct black spots, and pallidly yellow. Otherwise similar to the male.

Six specimens, Teulon, Man., May to Sept. (Dr. A. J. Hunter).

From *ribesii* it differs in having the antennæ red; thorax darker, antennæ less pointed; spot below the eyes; femora of female, black at base; the first pair of spots reach the margins in much greater width than in *ribesii*. From *rectus* it differs in the color of the antennæ, legs, and narrower abdominal bands. From *protritus*, to which it is closely related, in having the legs in both sexes largely black.

Syrphus opinator O. S.

Easily recognized. Squamæ pilose above; first abdominal band reaches the margin, the two following narrowly separated from margin; venter of female usually without black markings, venter of male with an elongate transverse black spot on second ventral and two broad complete black bands on following segments.

A western species which occurs west of the Rockies and as far east as Alberta in Canada. Five specimens from California (Davidson), B.C. (C. B. D. Garrett), and Alta. (Walsh).

Syrphus torvus O. S.

Readily distinguished by the presence of pile on the disc of the squamæ and pilose eyes. The species may be recognized at a glance by the elongate brown stigma and the presence of blackish spots on the venter, which are quite different from those in other species. The first spot is roundish, the second triangular, and the third usually extends wholly across the posterior margin of the third ventral. The base of the hind femora of the female is black.

A widely distributed and common species. I have specimens from Cal., B.C., Man., Ont. and N.H.

The above species constitute an unusually interesting group in the genus *Syrphus* and so far as I am aware there are no other European or North American species which have the disc of the thoracal squamæ hairy. Three of the species, *S. torvus*, *vitripennis* and *ribesii*, are common to Europe and North America. The species which follow all lack the pile on the disc of the squamæ but several are closely related to those above described.

Syrphus grossulariae Meigen.

A large beautiful species in which the abdominal bands extend over the side margins in their full width, including the basal spots. The wholly black antennæ and absence of pile on the disc of the squamæ and the black haired scutellum will readily distinguish this species.

I have a melanic female from Orillia in which the bands are shining metallic greenish with a reddish color distinguishable in some lights.

Syrphus xanthostomus Will. has the abdominal bands broader, the antennæ reddish and the scutellum yellow pilose.

Syrphus reflectipennis new species.

Eyes pilose; face with rather broad median black stripe; thorax metallic blackish blue, the scutellum similar, with a yellowish translucent reflection;

abdominal bands reach the margins in their full width. Squamæ not pilose above.

Length, 11.5 mm. Female. Face yellowish; cheeks, oral margin and a broad facial stripe, ending below the antennæ, blackish. Front shining black, with a metallic blue reflection, the sides opposite the antennæ narrowly dusted with yellowish pollen, expanding in the middle of the front, but leaving a broad shining stripe. Pile of the front black, of the posterior orbits and cheeks, whitish; of the eyes, whitish, sparse, not very conspicuous. Antennæ reddish, third joint above, and the arista, piceous.

Thorax with a strong metallic bluish reflection, pleuræ obscurely piceous, especially the sutures; scutellum metallic blue, translucent; pile of dorsum yellowish, of the pleuræ, longer, whitish, of the scutellum, longer, yellowish.

Abdomen, sub-opaque, moderately shining, the first and apical segments shining bluish black. Abdominal bands as in *Syrphus torvus,* but slightly narrower, deeply notched medially posteriorly, and extending over the margins in their full width. Pile yellowish on the two basal segments and the yellow bands, elsewhere, shorter, black.

Legs yellow; basal half of the front four and two-thirds of the hind femora, black; a band beyond the middle of the hind tibiæ and the apical joints of the hind tarsi, piceous.

Wings pellucid hyaline; stigma faintly yellowish.

Holotype, female, Orillia, Ont., May 26, 1913 (Curran), in the author's collection.

Syrphus ochrostomus Zett.

Antennæ red; differs from *ribesii, protritus,* etc., in the squamæ not being hairy above; from *grossulariae* in having red antennæ and legs, and narrower bands. Face yellow, with whitish pollen on the sides. Cheeks more reddish, with a large black spot below the eyes and the border of the eyes black from this spot to the posterior orbits. Thorax shining metallic greenish black, the pleuræ covered with whitish dust and almost white pile. Scutellum wholly yellow pilose. The abdomen is more shining than opaque. First pair of spots reach the margin in full width and the yellow extends forward along the margin, narrowly, to the slightly yellowish sides of the first segment. The two following bands are moderately attenuated laterally, and slightly notched in the middle posteriorly. The bands have a slight metallic greenish lustre, but are distinctly yellowish red.

One specimen, Orillia, Ontario, 1914 (Curran).

This species is very similar to *S. nitidicollis,* but the latter lacks the black orbital stripe below the eyes and the scutellum is black haired, except the base. The specimen described above agrees very well with a var. of *S. nitidicollis* mentioned by Verrall, but differs in the abdominal bands being attenuated laterally and in having the black stripe below the eyes. It may be distinct from *ochrostomus.*

Syrphus nitidicollis Meigen.

This species is moderately like the specimen I have described under *S. ochrostomus.* It is readily distinguished from other North American species by its red antennæ and metallic greenish reddish cross-bands, which are scarcely notched medially and extend over the margins in their full width,

entirely yellow anterior tarsi and black haired scutellum.

One specimen, Orillia, Ontario, 1914 (Curran).

Syrphus genualis Williston.

Face with oral margin, cheeks and median stripe shining black. Second and third abdominal bands narrow, straight, and not attenuated laterally, but extending over the margin in practically their full width. Hind legs blackish or brownish, except the base and tip of the femora and base of the tibiæ.

Williston described this species from a female taken at the base of Mount Washington, N.H. I believe that specimens recorded as this species from British Columbia must belong to the following species.

Syrphus rectoides new species.

Eyes bare, median facial stripe and cheeks black or brownish black; squamæ not pilose above.

Length 8 to 9 mm. Male. Face honey yellow, a broad median stripe, reaching to above the middle, the cheeks and the oral margin broadly, black or brown ; face a little retreating ; tubercle rather long, more conspicuous below ; pile black; frontal triangle shining black, thickly covered with yellow pollen except just above the base of the antennæ, the pile black. Antennæ black, third joint yellow on lower half, almost as broad as long, the end evenly rounded. Vertical triangle black, with black pile.

Thorax cupreous or bluish-black, with yellowish or yellowish brown pile, pleuræ with white pile. Scutellum yellow with black pile.

Abdomen opaque or sub-opaque black, the first segment, sides of the second, sides and apices of the third and fourth, and the fifth segment wholly, shining black. Second segment with a pair of moderately broadly separated sub-oval yellow spots, their inner ends rounded, their outer ends produced forward to the antero-lateral angles. Third segment with a sub-basal fascia, with a small median anterior triangular projection, almost evenly bi-convex posteriorly, and narrowly or not quite reaching the lateral margins. Yellow band on the fourth segment similar, but slightly narrower, apical margins of fourth and fifth segments and basal angles of the fifth, yellow. Pile of abdomen yellowish on basal corners, and the yellow spots, elsewhere, shorter, black.

Legs yellow; basal half of anterior four femora, and the hind legs, except the bases of the tibiæ, brown.

Wings hyaline or slightly darkened; stigma and sub-costal cell pallidly luteous.

Female. Abdominal bands narrower; pile shorter ; legs yellow ; hind femora with sub-apical band, and the hind tibiæ and tarsi, except the basal quarter of the tibiæ, reddish brown. Otherwise similar to the male.

Holotype, male, Cranbrook, B.C., May 22, 1919, about 3,400 ft.; Allotype, Bull River, B.C., May 20, 1919, 3,500 ft.; Paratypes, two females, Cranbrook, B.C., collected by C. B. D. Garrett. Types in Mr. Garrett's collection, paratype in the author's collection.

Very similar to *S. rectus* Osten Sacken, but readily distinguished by the facial stripe and bare squamæ; allied to *S. quinquilimbatus*, but the legs of the female are yellow basally and the scutellum is lighter; differs from *S. genualis*

in that the bands are attenuated laterally; differs from *S. vitripennis* in the black facial stripe.

TWO NEW CANADIAN CRAMBID MOTHS (LEPID.)

BY J. MCDUNNOUGH, PH.D.
Entomological Branch, Ottawa.*

Crambus tutillus sp. nov.

Primaries deep brown, costa with a faint white line at base of wing only; a rather narrow white stripe subcostally from base of wing to end of cell, broadest near apex and with lower margin toothed on vein 2; veins between apex of white stripe and subterminal line outlined in blackish with a distinct metallic tinge; beyond and just below stripe is an obsolescent white rectangular patch and above it on costa a small white patch preceding the subterminal line; this line metallic, arising from small white costal spot, edged inwardly by a dark shade line and obtusely angled on vein 6; a small white triangular spot below apex of wing and five black dots on outer margin at termination of veins; fringe white at apex and anal angle, metallic in central portion, slightly tinged with brownish outwardly. Secondaries dark smoky with pale fringes. Beneath smoky, paler terminally, with the black terminal dots of upper side of primaries repeated. Expanse 20 mm.

Holotype 1 ♂, Victoria B. C. (May 23rd,) (W. Downes) in Canadian National Collection.

Paratypes 5 ♂'s from same locality, collected between 12th, and 28th, May; in same collection.

The species has been passing under the name *dissectus* Grt., but differs from this species in the reduction of the white stripe and rectangular white patch and the entire lack of white shading along the inner margin. It is probably closest to *dumetellus* Hbn., differing in the much shorter and less distinct white costal line.

Crambus awemellus sp. nov.

Primaries light yellowish brown, paler above inner margin; a narrow white costal stripe, extending two thirds the length of the wing; below this and separated by a brown area a broader and slightly longer white stripe, edged above distally by a dark line and with bluntly pointed apex, terminating shortly before subterminal line; a white rectangular patch extending from just below apex of stripe to outer margin and crossed by subterminal line; veins in postmedian area outlined in white with narrow dark border lines; an oblique white costal streak separated from s. t. line by a small smoky patch; subterminal line white, slightly metallic and rounded outwardly opposite cell, edged inwardly by brown, costa at apex white and a white subapical triangular patch on outer margin; the usual terminal black dots preceded by short white stripes; fringes whitish, especially below apex, metallic outwardly. Secondaries pale smoky with white fringes. Expanse 19-20 mm.

Holotype 1 ♂, Aweme, Man. (Aug. 8th) (N. Criddle) in Canadian National Collection.

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*Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

Paratypes 3 ♂'s, Aweme, Man. (Aug. 12th, 15th, 18th) (N. Criddle) in Canadian National Collection and Collection Barnes.

The species resembles considerably a miniature *agitatellus* Clem. but the white stripe is narrower and has no tooth on lower margin; the coloration shows less of the ochreous shades found in this latter species. A specimen from South Park, Colo., (Oslar) in the Barnes Collection appears to belong to this species. Worn specimens tend to show a general diffusion of the white areas.

A METHOD OF MAKING PHOTOGRAPHIC PRINTS OF INSECT WINGS.

BY R. P. GORHAM,
Assistant Entomologist, Entomological Branch, Ottawa.

In some work with Diptera it was found desirable to obtain a series of photographs of wing venation in a number of different families. A very convenient, inexpensive and rapid method of making these was found, and, as it seems possible that it may be of use to others, it is herewith described. In brief, it consists of using the insect wing itself as a negative and making an enlarged print.

In making the prints the first step is to mount one, or a number of wings, between two sheets of glass so they may be held flat. Glass microscope slides are found to be of a desirable size. For quick work the wing or wings are placed in position on one slide and another similar slide placed over them and held in place by rubber bands. For a permanent mount to be kept for future use, the wing is mounted in balsam. The slide is then placed in a printing frame at the back of a camera and the latter set up in the window of a dark room in the ordinary way for enlarging. The image is projected on a white screen, which is moved toward or away from the camera until the desired size of wing is obtained. Then the shutter is closed and a sheet of bromide paper pinned on the screen and exposed in the usual way to the light rays passing through the wing and camera lens. With very bright sunlight out-of-doors and using enameled paper, one-half minute to one and one-half minutes has been found sufficient time with the smallest of shutter openings. The time will vary with the intensity of the light and the density of the wing.

For ordinary use a print showing a wing length of three inches is found sufficiently large. All details can be clearly seen in a print of that size, and four such prints can be made on one sheet of 5 in. x 7 in. paper. Prints can be made of any desired size up to the limit of the paper available. In the case of the Culicidæ large prints show the scales on the wing veins clearly.

The method seems well adapted for the study of wing venation in those orders of insects having hyaline wings, as the photo-print is more accurate than an ordinary drawing. All parts are enlarged to such size that they can be distinctly seen without the use of a lens, and the exact position of picture spots and shadings of the membrane is also shown. Another advantage is that a number of wings of different species can be printed together at one time on one sheet of paper for comparison by the eye or by measure—all being enlarged the same number of times.

A few test prints made from lepidopterous wings mounted in Xylol-

Balsam have shown that fairly satisfactory results can be obtained with moth wings which have distinctly dark-colored veins. Since the prints are really negative in character the formation of a clear image of the wing vein is dependent on interference with the free passage of light rays. For this reason the wings of *Ctenucha virginica*, even though covered with dark scales, give excellent wing prints, due to the very opaque structure of the veins.

The use of the wing print in the classroom has been tried on a very small scale, but with good results. Students of systematic entomology had before them specimens of the particular insect they were trying to identify and also an enlarged print of the wing. On the print they were able to see distinctly the particular features of wing venation which the instructor wished them to note and then to locate them by the aid of a lens on the wing of the insect. In cases where a particular feature of wing venation has to be determined, in order to successfully use a systematic key, the enlarged print is useful to both instructor and student. When the particular feature has been once located a marked print can be kept at hand for quick comparison with the wings of other insects which the student is tracing through the systematic key, and in this way the time often wasted in searching for negative characters can be saved and doubtful determinations to some extent avoided.

UNDESCRIBED ERIOPTERINE CRANE-FLIES FROM ARGENTINA (TIPULIDAE, DIPTERA)

BY CHARLES P. ALEXANDER,
Urbana, Illinois.

The following species of crane-flies belong to the extensive tribe Eriopterini. They were included in material collected by Dr. Charles Bruch and Engineer V. Weiser and sent to the writer for determination. The writer would express his gratitude to Dr. Bruch and Senor Weiser for the privilege of examining this interesting series of crane-flies.

Erioptera (Erioptera) cladophoroides, sp. n.

Similar to *E. cladophora* Alexander (Brazil); size much larger; body and legs darker colored.

Male—Length about 4.2 mm.; wing 4.3—4.5 mm.

Female—Length 4.3—4.5 mm.; wing 4.5—5.3 mm.

Rostrum reddish brown; palpi dark brown. Antennæ brown; flagellar segments in the male with elongate verticils. Head buffy, dark gray pruinose.

Mesonotal praescutum light gray with a broad brownish fulvous median stripe, the lateral margins of which are bordered with a series of dark brown setigerous punctures; tuberculate pits large, shiny black, separated by a distance a little greater than the diameter of one, situated entirely within the brown median stripe; pseudo-sutural foveae elongate, brownish black; a conspicuous subquadrate brown spot on the lateral margins of praescutum before suture; scutum light gray, the centres of the lobes light brown; scutellum light gray with a narrow brown median line; postnotum gray. Pleural region gray with a broad silvery gray longitudinal stripe, delimited ventrally and more broadly dorsally by narrow brown stripes. Halteres testaceous. Legs with the coxae

gray pruinose; trocanters testaceous; femora dark brown, pale basally, with three narrow white annuli; tibiae with four black and four white annuli arranged alternately, the latter a little narrower than the former, the apical band white; metatarsi black, the intermediate third white; second tarsal segment white, the apex and remainder of tarsi black. Wings whitish subhyaline, the basal third more grayish; a faint gray suffusion beyond the cord; a narrow dark brown seam along the cord, small brown clouds at *h*, arculus, origin of *Rs*, Sc_2, Sc_1, tips of the longitudinal veins at the wing-margins; a brown cloud at the fork of M_3 plus Cu_1, and a conspicuous mark near the wing-base behind vein *Cu*; veins pale, darkened in the infuscated areas. Venation: as in the *annulipes* group; a conspicuous spur near the tip of the strongly sinuous vein *2nd A* as in *E. cladophora*.

Abdomen brown, the sternites paler. Male hypopygium with two pleural appendages, the outermost profoundly bifid, the outer arm similar to the inner arm but a little shorter, both arms acicular; inner pleural appendage a slender chitinized arm that narrows to the acute blackened point. Gonapophyses slender, the tips blackened and slightly incurved.

Habitat—Argentina.

Holotype, ♂, La Plata, October 13, 1920 (C. Bruch).

Allotopotype, ♀.

Paratopotypes, 7 ♂ ♀, October 13-18, 1920.

Type in the collection of the author.

Molophilus cladocerus, sp. n.

Related to *M. honestus* Alexander; pleural appendage of the male hypopygium heavily chitinized, slightly beyond midlength forking into two subequal acutely pointed branches.

Male.—Length 4—4.2 mm.; wing 4.5—5 mm.

Female.—Length 5 mm.; wing 5.5 mm.

Rostrum and palpi brown. Antennae comparatively short, brown. Head light yellow.

Mesonotum light yellowish brown, unmarked with darker; lateral margins almost white; postnotum darker brown. Pleura testaceous, the dorsal region dark brown, continued to the postnotum. Halteres yellow. Legs with the coxae and trochanters yellow; remainder of the legs dark brown, the femoral bases yellow. Wings with a strong yellowish tinge; veins pale brown, those in the costal region more yellowish.

Abdomen pale brown; hypopygium yellow. Male hypopygium with the apparent ventral appendage heavily chitinized, at a little beyond midlength branched, the inner branch only a little shorter than the outer or principal branch, both branches gradually narrowed to the smooth, acute points; remainder of the hypopygium almost as in *M. honestus*.

Habitat.—Argentina.

Holotype, ♂, Arroyo Famailla, Tucuman, altitude 400 meters, October 18, 1920 (V. Weiser).

Allotopotype, ♀, October 12, 1920.

Paratopotypes, ♂ ♀.

Type in the collection of the author.

Gonomyia (Gonomyella) thiosema, sp. n.

General coloration yellow; centre of the vertex dark brown; mesonotal praescutum with three broad stripes; median sclerite of postnotum broadly dark brownish black; pleura yellow with a narrow dark brown stripe; legs dark brown, the femoral bases paler; wings with a faint brownish tinge; male hypopygium with two flattened pale pleural appendages.

Male.—Length 5 mm.; wing, 4.8 mm.

Rostrum brown; palpi dark brown. Antennal scape sulphur-yellow; flagellum dark brown. Head obscure yellow, the centre of the vertex largely dark brown.

Pronotal scutum brown, yellowish laterally; scutellum sulphur-yellow. Mesonotal praescutum light brown, the lateral margins and humeral region yellow; a small brown spot on the lateral margin of sclerite; three broad dark brown stripes; scutum obscure brownish yellow, the lobes dark brown; scutellum brown, broadly margined with yellow; postnotum broadly brownish black medially, the anterior lateral regions yellow; lateral sclerites of postnotum yellow, the caudal margins brownish black, these areas lying immediately before the halteres. Pleura sulphur-yellow, narrowly striped longitudinally with dark brown; sternites reddish brown. Halteres dark brown, the basal half of the stem paler. Legs with the coxae yellow, the basal half of the fore coxae dark brown; trochanters yellow; remainder of legs dark brown, the femoral bases obscure yellow. Wings with a faint brownish tinge; veins dark brown. Venation; *Sc* long, Sc_1, ending just beyond midlength of *Rs*, Sc_2 some distance from the tip of Sc_1, the latter alone about equal to *r-m*; *Rs* long, very gently arcuated; *r* on R_{2+} at about two-fifths its length; R_2 oblique, parallel to ultimate section of R_1, shorter than R_3; petiole of cell *2nd M2* about equal to cell; basal deflection of Cu_1 a short distance beyond the fork of *M*.

Abdomen dark brown; sternites obscure brownish yellow. Male hypopygium with the pleurites stout; the proximal face densely set with a cushion of slender setiferous tubercles; apex of pleurite tipped with a short cylindrical lobe that is provided with a pencil of stiff yellow bristles. Two pleural appendages, the outer one very pale and flattened, the apex directed proximad; inner appendage shorter, more chitinized, flattened, on the face with two setiferous tubercles. Penis-guard stout, the apex simple.

Habitat.—Argentina.

Holotype, ♂, Famailla, Tucuman, October, 1920 (V. Weiser).

Type in the collection of the La Plata Museum.

Gonomyia (Leiponeura) misera, sp. n.

Rostrum reddish; antennae black, the enlarged second scapal segment a little reddish basally; general coloration pale brownish testaceous; pleura testaceous yellow; wings subhyaline, unmarked; male hypopygium with the outer angles of the pleurites produced into stout pale spines, the tips blackened and densely covered with short, appressed hairs; penis-guard stout, pale, longer than the remaining elements of the hypopygium.

Male.—Length 3.5—3.6 mm.; wing 3.8—4 mm.

Female.—Length 3.5—3.8 mm.; wing 4—4.1 mm.

Rostrum reddish; palpi dark brown. Antennae black, the enlarged

globular second scapal segment reddish brown basally; flagellar segments with very long verticils in the male. Head with front and anterior part of vertex reddish; remainder of vertex brown; genae and occiput obscure yellow.

Thoracic praescutum testaceous brown, unmarked; posterior sclerites of mesonotum obscure yellow. Pleura testaceous yellow. Halteres pale, the knobs obscure yellow. Legs with coxae and trochanters obscure yellow; remainder of the legs pale brown. Wings subhyaline, unmarked; veins pale brown. Venation: Sc_1 ending far before origin of *Rs*, the distance from three-fourths to equal to length of *Rs*; Sc_2 some distance from tip of Sc_1; *Rs* rather long, nearly straight; cell 1*st* M_2 closed; basal deflection of Cu_1 at or before the fork of *M*.

Abdomen light brown, the sternites and hypopygium a little paler. Male hypopygium with the ninth tergite conspicuous, semi-cylindrical, the caudal margin truncated or feebly concave, the lateral margins and angles with numerous short appressed spines; outer angle of the pleurite produced caudad into a stout pale spine which gradually narrows to the acute blackened point, this blackened tip covered with abundant tiny appressed hairs; pleural appendage shorter than this spine, its tip provided with several powerful bristles. Penis-guard pale, very stout at base, tapering to the pale flattened tip; penis-guard exceeding all other elements of hypopygium.

Habitat—Argentina.

Holotype, ♂, Arroyo Famailla, Tucuman, altitude 400 meters, October 12, 1920 (V. Weiser).

Allotopotype, ♀.

Paratopotypes, 8 ♂ ♀.

Type in the collection of the author.

Paratropeza xystophanes, sp. n.

Head and antennae black; mesonotal praescutum yellow with three black stripes; postnotum with the cephalic half obscure yellow; pleura black with a narrow yellowish longitudinal stripe; wings faintly brownish yellow, stigma triangular, dark brown; *r* near the end of *Rs*; abdominal tergites brownish yellow with a narrow, median brown longitudinal line.

Male.—Length 7mm.; wing 8.6 mm.

Rostrum and palpi black. Antennae black. Head shiny black.

Pronotal scutum obscure yellow, indistinctly blackened anteriorly, scutellum yellow. Mesonotal praescutum shiny yellow with three broad shiny black stripes; scutum yellow, the lobes marked with black; scutellum light yellow; postnotum obscure yellow, the caudal half dark brown. Pleura black; a narrow yellowish longitudinal stripe extending above the coxae; a small patch of whitish appressed pubescence above the middle coxae and an extensive area on the metapleura. Halteres dark brown, the knobs conspicuously yellow. Legs with the fore coxae and trochanters obscure chestnut, the remaining coxae and trochanters more yellowish; fore femora brownish black with about the basal third more yellowish; remaining femora more uniformly brownish testaceous; tibiae brown, the tips a little darker; tarsi dark brown. Wings with a faint brownish yellow tinge; stigma triangular, dark brown, surrounding the radial crossvein; a very narrow and indistinct brown seam along the cord and

the outer end of cell 1*st* M_2 ; veins dark brown. Venation: Generally similar to *P. jactans* Alexander (Brazil); *Rs* more arcuated; *r* close to the fork of *Rs;* basal deflection of Cu_1 a short distance beyond the fork of *M*.

Abdomen shiny brownish yellow, the tergites with a narrow black median line; sternites clearer yellow; hypopygium darkened.

Habitat.—Argentina.

Holotype ♂, Quebrada Famailla, Tucuman, altitude 1,600 meters, October 16, 1920 (V. Weiser).

Type in the collection of the LaPlata Museum.

Teucholabis omissa, sp. n.

Mesonotum obscure yellowish brown with three brownish black stripes; pleura black with a broad yellowish testaceous longitudinal stripe; wings faintly brown; stigma darker brown, subcircular; cell 1*st* M_2 open by the atrophy of the outer deflection of M_3.

Female.—Length 5 mm.; wing 5.2 mm.

Head broken.

Pronotum yellow. Mesonotal praescutum obscure yellowish brown with three interrupted shiny brownish black stripes, the median stripe indicated only on the cephalic margin of the sclerite as a shiny area; lateral stripes narrower and less distinct; scutum obscure brownish yellow, the lobes marked with black; scutellum and postnotum obscure brown, covered with a short white pubescence. Pleura black with a broad yellowish testaceous longitudinal ventral stripe, passing beneath the root of the halteres; pleura with a short white pubescence. Halteres brown, the knobs obscure yellowish brown. Legs with the fore coxae dark brown; middle and hind coxae pale brown, whitish pubescent; trochanters obscure yellow; femora obscure yellow, the tips darkened; tibiae brown, the tips darker brown; tarsi dark brown. Wings comparatively narrow, with a faint brownish tinge; stigma darker brown, subcircular veins dark brown. Venation: *Sc* moderately long, Sc_1 ending at about two-fifths the length of *Rs;* Sc_2 lacking; *Rs* long, gently arcuated; *r* a short distance beyond the fork of *Rs;* petiole of cell 2*nd* M_2 about one-half of this cell; cell 1*st* M_2 open by the atrophy of the outer deflection of M_3 ; basal deflection of Cu_1 a short distance beyond the fork of *M*.

Abdomen dark brown, the basal sternites obscure yellow. Ovipositor with the basal shield black; valves of the ovipositor yellowish horn-color, strongly upcurved.

Habitat.—Argentina.

Holotype, ♀, Arroyo. Famailla, Tucuman, altitude 400 meters, October, 1920 (V. Weiser).

Type in the collection of the La Plata Museum.

Teucholabis omissa is readily told from all described species of the genus, with the exception of *T. omissinervis* Alexander (Peru) by the open cell 1*st* M_2 .

NOTE ON THE GENERIC POSITION OF TWO CANADIAN ARCTIIDS WITH DESCRIPTION OF NEW SPECIES. (LEPID.)

BY J. MCDUNNOUGH, PH. D.,
Entomological Branch, Ottawa.*

In our latest lists following Dyar (1903, List N. Am. Lepid. 87), *yarrowi* Stretch has been placed in the genus *Neoarctia* N. & D. Hampson included it in his genus *Phragmatobia* Steph. (1901, Cat. Lep. Phal. Brit. Mus. III., 242), but the species was evidently unknown to him. An examination of specimens of this rare species in the Canadian National Collection shows that it falls into *Hyphoraia* Hbn. as defined by Hampson, the eyes being hairy and veins 7, 8, 9 and 10 stalked.

The species *alpina* Ques., listed by Hampson as a synonym of *Hyphoraia lapponica* Thun. (*festiva* Bork.) has already been shown to be a distinct species by Mr. Gibson (1920, Rep. Can. Arct. Exp. III., Pt. J, 31.). A further examination shows that it is not even associated generically with *lapponica*, the eyes being non-hairy and there being a distinct areole present in the venation of primaries with veins 7, 8 and 9 stalked from its apex. According to Hampson's keys, *alpina* would fall into *Arctia* Schrank along with *caia* and *villica*; according to maculation it has more similarity with *Platyprepia guttata* Bdv. The genus *Platyprepia* was separated by Dyar from *Arctia* (1897, Can. Ent., XXIX., 212) on the strength of the areole being wanting; this is, however, scarcely correct, for in a majority of specimens of *guttata* examined by me the areole was present and the lack of same is decidedly an aberrant character which cannot be used for generic separation; the smooth thoracic squammation is probably a better means of separation of the two genera. More recently Dyar, in a criticism of the Barnes & McDunnough "Check List" (Ins. Ins. Menst. v. 43), claims that *Platyprepia* should be transferred to the Hypsidae, an Indo-australian group separable from the *Arctiidae*, according to Hampson (Cat. Lep. Phal. Brit. Mus., I., 17), by the fact that vein 8 of the secondaries is not anastomosed with 7, but connected by a cross-bar. The venation of *guttata* Bdv. does not bear out this contention; it is practically identical with that of *caia* L., vein 8 being fused to 7 for almost half the length of the cell. The general type of male genitalia is quite similar in the two species and the larvae also bear a great resemblance to each other. Unless the conception of the family *Hypsidae* has been changed since the publication of Hampson's work, I see no reason why *Platyprepia* should not be retained in its present position in the Arctiidæ and should strongly incline, on account of the great similarity of genitalia, to place *alpina* Ques. along with *guttata* Bdv. in this genus.

In the Canadian National Collection is a single ♀ collected a number of years ago at Banff, which appears to represent a new species of *Neoarctia*, probably closest to *cervina* Fall. from the Alps. The description is as follows:—

Neoarctia sordida sp. nov.

♀. Palpi pale ochreous; head and front with short black hair, mixed with pale ochreous; legs ochreous; tegulae ochreous with two distinct central black spots; thorax and patagia black, the latter faintly bordered with ochreous;

*Contribution from Entomological Branch, Dept. of Agriculture, Ottawa.

abdomen lacking Primaries thinly scaled, black; costa and fringes pale ochreous; traces of ochreous along cubitus and vein 1; t.a. line broad, pale ochreous, strongly outwardly oblique from costa to below cubitus, then angled inwardly and oblique to inner margin a little over 1-3 from base. T.p. line broad, ochreous, rounded outwardly below costa and then parallel to outer margin; s. t. line ochreous, rather indistinct; inwardly oblique from costa to vein 6, then forming a prominent W mark, touching t.p. line below veins 4 and 2, and the outer margin at veins 1, 2 and 5. On one side only a small costal spot just beyond t. a. line. Secondaries almost uniformly dark smoky, slightly paler subterminally. Beneath paler than above with costa of both wings scaled with ochreous and a sprinkling of pale scales over entire surface; primaries with maculation of upper side faintly reproduced; secondaries with two fairly evident dark subterminal round spots on vein 2 and between 5 and 6. Expanse 30 mm. *Holotype*, 1 ♀, Banff, Alta. (June 13, 1914) (N. B. Sanson), in Canadian National Collection.

The species is much less hairy in the vestiture of head and thorax than either *brucei* Edw. or *beani* Neum., but by venational characters seems best placed in the above genus.

COSYMBIA LUMENARIA HUB: A CORRECTION.

BY E. H. BLACKMORE,
Victoria, B. C.

In a recent letter from Mr. L. B. Prout of London, England, commenting on some geomitrid notes in Ann. Report Prov. Mus. Nat. His. B.C., 1919, he asks me not to use the name *Cosymbia lumenaria* for *C. pendulinaria*, as it is a gross misidentification on the part of the late Dr. Hulst.

Wishing this to be corrected in North American Check Lists, he has given me some notes on the subject which I present in the following form:

1832. Geyer in his continuation of Hubner's Zutr. Exot. Schmett. figured as *lumenaria* a species which he erroneously believed to be from North America but which is really East Indian.

1895. Hulst in working up the old literature came across this figure and making a guess at identifying it with some North American species, picked on *pendulinaria* as being the same.

1896. Hampson (Moths of India, IV., p. 556) found the correct determination of *lumenaria*, sinking his own *Rambara ochreicostalis* in the synonymy.

American authors have, not unnaturally, overlooked this and continued to perpetuate Hulst's error.

In the meantime our American *Cosymbia* had been named *pendulinaria* by Guenée (1857) and this is the oldest name belonging to it.

On looking up Genera. Ins. Fasc. 104, p. 73, I find that *lumenaria* Geyer is placed in the genus *Derambila* Walk. and its distribution is given as India to Malaysia. The apparent discrepancy of authorship is attributable to the fact that Geyer was editor of Hubner's works for a long time and continued them in Hubner's name after the death of the latter. This has given rise to a lot of inconsistencies in citation.

The name of *lumenaria* Hub. will have to be dropped from our North American Lists and *pendulinaria* Gn. will now takes its place.

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POPULAR AND PRACTICAL ENTOMOLOGY.

THE CABBAGE SEED STALK WEEVIL (CEUTORHYNCHUS QUADRIDENS PANZER) AN IMPORTANT PEST OF CABBAGE SEED PLANTS ON LONG ISLAND.

BY I. H. VOGEL,*

Cornell University, Ithaca, N. Y.

The cabbage seed stalk weevil is a European insect. Panzer (1796)[1] first described the species. Goureau (1866)[2] found the larvae living within the roots of rape. Perris (1877)[3] reported water cress and mustard as host plants for the larvae. Lind et al (1914)[4] found it occurring comparatively common in seed cauliflower and turnip in Denmark. According to Redtenbacher[5] it occurs on rape in Austria and Bargagli[6] reports it on the flowers of horse radish and cabbage.

Slingerland (1894)[1] reported it first in the United States as infesting cabbage seed stalks on Long Island. It was later reported[2] from Nantuckett, Massachusetts. Sirrine (1895)[3] observed it on seed plants of kale, cabbage and turnip on Long Island. Specimens were sent to Dietz who described it as a new species (*Ceutorhynchus scriesetosus*). Chittenden (1901)[4] identified specimens for Slingerland as *C. quadridens* Panzer. Schwartz later confirmed this identification.

There is little information in literature regarding the life history of this insect.. Slingerland (1894)[4] reared adults from larvae found in cabbage seed stalks. These adults are the same as were later identified by Chittenden (Preserved in Cornell University Entomological Collection).

During the season of 1920 the author had the opportunity to observe this seed stalk weevil in the cabbage fields in the vicinity of Mattituck, Long Island, N. Y. Eggs were found first in the field on May 18th. They were deposited on the under side of the mid-rib of young and old cabbage leaves. Nearly every plant contained eggs. No larvae were found at this time. Although egg laying continued until May 26th the method of oviposition was not observed. The eggs were laid in punctures, the number in each puncture varying from three to seven. The tissue surrounding the puncture makes very rapid growth, thus forming a very conspicuous scar. The eggs are white, elliptical and about one millimeter in length. Each egg has at one end a slender pedicel which is about one-half millimeter in length. This attachment of the egg is very

1 Faunae Germanicae, Heft 36, p. 13, 1796.
2 Annales de la Societe Entomologique de France, Vol. vi., p. 171-172, 1866.
3 Larves de Coleopteres, 1877, p. 408.
4 79 Beretning fra Staten Forsogsvirksamdid i Plantkulture Copenhagen, No. 30, 1914.
5 Fauna Austriaca, Vol. 11, p. 344.
6 Ibid, page 264.
1 Cornell Agr. Exp. Sta. Bulletin 78, 1894.
2 Transactions of American Entomological Society 1896, p. 422.
3 New York Agr. Exp. Sta. Rept. 1896, p. 603.
4 Notes of Slingerland. Cornell University Exp. No. 455.
*Contribution from the Entomological Laboratory, Cornell University.

fragile. Observations made on material collected showed the eggs hatched in about four days. According to this observation the egg laying period doubtless began at least by May 16th.

The larvae enter the mid-rib through the puncture. They burrow in the mid-ribs and extend their work down to the pith of the branches and main stalk. Instances were observed where more than thirty larvae were found in a leaf mid-rib two and one-half inches in length and one hundred and fifty in a single plant. The larval period occupied about ten days, after which they emerge from the stalk by boring small holes in the side of the stalk or branch. Doubtless each hole serves as a means of escape for several larvae as there are apparently more larvae in a stalk than holes. The larvae drop to the ground and pupate.

The mature larva measures 4-5 mm., legless, white. Head lemon yellow with dark brown tipped mandibles. The body is composed of 12 easily recognized segments, each segment, especially those of the abdomen, is marked with distinct ridges.

Pupation occurs near the surface of the soil in brown, fragile pupal cells made of earthen material. Each cell measures 5mm. in length. The pupal period occupies about ten days. The pupa measures 3mm; white; scattered over the thorax, head, beak and tip of femora are prominent brown spines. These spines serve to keep the delicate pupa from touching the roughened surface of the pupal cell. Shortly after pupation the eyes become jet black. As the pupa grows older it gradually becomes darker.

The adults of the seed stalk weevil were found in the field from June 16 to July 10th. They are rather difficult to observe, due to the minuteness, color and habit of "playing possum" upon the least disturbance. They can be readily observed during the fore part of a still, warm day on the upper branches and in the axils of the leaves of the seed stalks.

Blatchley and Leng give a good description of the cabbage seed stalk weevil in "Rhyncophora of North America" p. 443.

The insect undoubtedly hibernates as an adult although no trace of it could be found after it had disappeared from the fields in July.

In general the cabbage seed growers on Long Island either failed to recognize this insect or confused it with the larval stage of the common cabbage maggot (*Phorbia brassicae* Bouche). It is due to this confusion that little information has been secured concerning its distribution and destructiveness in the past.

The distribution of this weevil in the cabbage seed field in the vicinity of Mattituck seemed quite general during the past season. The information collected was taken from a comparatively few fields although characteristic signs of the presence of the insect were seen in nearly every field in that vicinity.

The losses to the cabbage seed grower are due to the larvae burrowing in the pith of the main stalks and branches thus weakening the plant and causing it to break over or die prematurely. In either case the quantity and quality of seed produced by an infested plant is inferior to that of a plant not infested.

In order to learn to what extent the weevil occurs and to determine the losses caused by it, counts were made in five fields. It was found that forty-seven

percent of the plants were injured to some degree. At harvest time one hundred normal plants and an equal number of plants attacked by the insect were threshed. The amounts of seed secured, both before and after cleaning, are given in the following table:

One hundred plants each	Weight of seed before cleaning	Weight of seed after cleaning	Percent of seed lost in cleaning
Not infested	109.2 oz.	97.4 oz.	11
Infested	74.3 oz.	64.8 oz.	13
Loss due to insect		32.6 oz.	

Plants not attacked by the insect therefore yielded practically thirty-three and one-half per cent. more seed than the attacked plants. Since there were forty-seven per cent. of the plants attacked by the insect the loss would be sixteen per cent of the crop. The seed yield was approximately two hundred and fifty pounds per acre this year, and consequently the loss occasioned by the weevil was forty pounds per acre valued at fifty dollars (1920). Even greater losses have doubtless occurred since a cabbage seed contractor and some growers have cited instances where in previous years this insect has occasioned the loss of entire crops.

NEW SPECIES OF SYRPHIDAE (DIPTERA)

BY C. HOWARD CURRAN,
Orillia, Ont.

Syrphus invigorus, new species.

Eyes bare ; face yellow, cheeks and oral margin black ; no facial stripe ; first and third abdominal bands interrupted, the second entire. Length 10-11 mm.

Male. Face and sides of front reddish yellow ; cheeks, oral margin and sides of the face, reaching to the tubercle, brownish black, posterior oral border reddish yellow ; face finely white pilose and more or less whitish pubescent ; tubercle rather large, the epistoma not at all produced; front black in the middle; frontal pile yellowish or sometimes brownish, of the vertex, black, of posterior orbits, white; eyes bare. Antennae reddish yellow or orange, more or less brownish above; arista reddish brown.

Thorax shining greenish black, with pallid yellowish white pile, more yellow along the lateral margins before the suture, and almost white on the pleurae. Scutellum translucent pale yellowish brown the base and sides black ; pile whitish.

Abdomen opaque black, the first segment and complete borders of the following segments, the lateral margins more narrowly, shining black, sometimes with a greenish tinge. Second segment with a large triangular spot in the middle on each side; third segment with an abbreviated yellow band moderately separated from the anterior margin, deeply incised posteriorly(about half through) and usually with a small triangular projection in the middle anteriorly; the band is broadest laterally and is narrowly separated from the lateral margins. Band on fourth segment similar, but moderately interrupted in the middle, the inner ends of the spots formed being almost evenly rounded posteriorly to the lateral fourth; apex of third segment in the middle and base of fourth at the sides, narrowly yellow; apex of fourth segment and triangles on the basal

corners of the fifth more broadly reddish yellow. None of the bands reach the lateral margins. Pile yellowish white or white on base of abdomen, rather long; dusky along the margins, the apical half of third to fifth segments with blackish pile laterally; opaque areas, except the base, with shorter black pile; yellow bands with yellow pile. Abdomen rather slender; only a little oval.

Legs reddish yellow; basal half of the front four femora, and three-fourths of the hind femora, an obscure ring on the apical third of the hind tibiae, and the hind tarsi apically, reddish brown. Wings slightly tinged with luteous; stigma and sub-costal cells luteous, and base of wings more or less so. Squamæ bare.

Holotype, male, Orillia, Ontario, May 30, 1920, two *paratypes,* same date, taken by the author, poising above small maple tree in opening in deep woods. Types in author's collection.

Syrphus americanus var. vinelandi n. var.

Length 9-10mm. Differs from typical *S. americanus* as follows:

The yellow bands in both sexes are narrower, being not wider than the black.

Female: Hind femora black at the base; front more broadly shining black in the middle, and the width at the vertex apparently slightly less; fifth abdominal segment more black.

Male: The spots above the roots of the antennæ are larger and darker than in most specimens of *americanus*; the black of the cheeks is usually connected to the black facial stripe along the oral margin by a brown or black stripe.

This variety seems to approach *S. nitens* much more closely than typical *americanus,* as the bands are usually more emarginate behind.

30 specimens from Ontario and four from Wisconsin. Types in the Museum of the California Academy of Sciences.

The great difference in the larvæ of the typical species and the variety would seem to indicate two distinct species, but it is impossible to distinguish many males, and even some females have the base of the hind femora only brownish. The larvæ are green with an irregular brownish blotch on the dorsum, while in typical *americanus* they are yellowish brown or grayish brown with very much more numerous small spines.

Syrphus americanus var. pomus n. var.

This variety is very similar to the above, but the size is only 7 to 8mm. and the color is darker throughout. The abdominal bands are slightly narrower, the oral margin is more broadly darker and the legs are darker. I can find no good characters for separating the two varieties, but the larvæ are very different.

Larvæ pale grayish yellow, the dorsum more brownish and with somewhat fewer small spines than in typical *americanus.* The larvæ are the only ones I have observed living exposed to the sun. They feed upon *Aphis pomi* but are not abundant.

Holotype and *allotype* in the author's collection.

Syrphus rubripleuralis, new species.

Habitat, California.

Eyes bare: abdomen with only two crossbands, situated on third and fourth segments; sides of abdomen nearly parallel.

Length, 8.5mm. Female. Face dull yellow, the tubercle, oral margin and cheeks reddish brown; in profile gently concave below the antennal prominence to the tip of the prominent tubercle thence somewhat triangularly excavated to the tip of the slightly prominent epistoma; pile fine, sparse, whitish. Antennæ reddish ferruginous, brownish above; arista reddish, rather stout. Front dull black, above, and a central longitudinal area, shining; above the antennae with an arch similar in color to the face and connecting at the sides with the facial ground color; immediately above the antennae, piceous; pile black, rather dense; posterior orbits silvery pollinose. The width at the vertex is about one-third the width at the antennae.

Thorax shining black, the mesopleuræ obscurely reddish posteriorly; pile white, long and silvery on the pleuræ. Scutellum yellow, its base and margin narrowly black, its pile black, and longer than on the thorax.

Abdomen more slender than the thorax, elongate, opaque black, the first segment, anterior third of the second, and the lateral margins of the whole abdomen, shining greenish black; pile long and silvery on the basal two segments, on the lateral margins sparse, whitish or grayish, on the yellow bands yellowish, elsewhere, black, shorter. Third and fourth segments with a narrow, yellowish red band, separated from the anterior margin by about the width of the band, and narrowly separated from the lateral margins; the bands are narrowest in the middle, gradually increasing in width to their ends. In some lights the lateral margins of the apical half of the abdomen appear reddish and the sides of the first segment luteous.

Legs brownish red; base of the front four femora, tips of the tarsi, and the hind legs chiefly, more reddish brown.

Wings hyaline, stigma luteous; spurious vein unusually well developed, rising from the second vein just before the base of the third longitudinal vein and almost united at its apical end with the fourth vein just before the junction of the fourth and fifth veins. Anterior cross-vein almost rectangular and placed about one fourth the distance from the base of the discal cell. Subcostal cell yellow-luteous.

Holotype, female, Mt. Wilson, Cal., Oct. 18, 1917, (E. P. VanDuzee), in the Museum of the California Academy of Sciences.

This species is rather striking and reminds one of *Melanostoma*. If Matsumari's classification were accepted, it would form a new genus near *Syrphus*, because of the position of the anterior cross-vein, and the slender abdomen. Matsumari's genera seem much too artificial to be accepted and I cannot agree with him, therefore I leave the present species in the genus *Syrphus*.

Sphaerophoria cranbrookensis, new species.

Swollen portion of the hypopygium almost circular in outline when viewed from above; terminal plates very short, about four times broader than long, the apical pile not dense, directed forwards, rather long, yellow. Abdomen deep shining black, with reddish yellow bands.

Length, 10mm. Male. Face and front creamy yellow, the middle of the face and oral margin translucent: face with inconspicuous pile, front with short, sparse, pallid pile. Antennae yellow: third joint above, and the arista, black. Vertical triangle with long black pile. Cheeks blackish, a yellow spot below the eyes. Posterior orbits blackish, with grayish pollen and silvery pile on the lower half, yellow pollen and black and yellow pile intermixed on the upper half.

Thorax metallic greenish black, with tawny pile; lateral stripes broad, whitish, to the suture, thence indistinct to the post alar callosities. A spot above the front coxae, a large mesopleural spot and a smaller one below it, and the sterno-pleurae, yellowish white. Scutellum pale yellow, with black pile.

Abdomen shining black, its lateral margins narrowly yellow; second segment with a moderately narrow arched band about the middle, the ends narrowed slightly towards the margin, where it connects with the yellow margin, a small triangular notch in the middle of the yellow band. Third segment with similar, but slightly broader band, except that there is a slight projection posteriorly on each side of the median notch. The third band is much narrower on the lateral quarter, more deeply notched medially, and more produced posteriorly on each side of the notch. Fifth segment yellowish red, with a small median triangular black dash and a large black spot on each side, reaching nearly to the hind margin. Hypopygium as described above.

Legs pale yellowish, with appressed black pile; tarsi reddish.

Wings hyaline. Squamæ yellowish with a blackish or reddish border and short reddish pile.

Holotype, male, Cranbrook, B. C., May 25, 1919, collected by C. B. D. Garrett, in the collection of Mr. Garrett.

Ceria ontarioensis, new species.

Very much like *C. abbreviata* superficially but without the antennal pedicel, and with U's on the third and fourth abdominal segments; differs from *C. signifera* in having black legs and different arrangement of yellow on the face, etc.

Female. Length, about 10.5mm. Face black, with a broad obtusely conical spot on each side below the antennae connecting broadly on the sides with an elongate spot at the orbits which runs downwards towards the oral margin about four-fifths of the distance, the two stripes converging below; above these, small round orbital spots opposite the antennae, an obscure median facial stripe and an obscure arcuate spot on the cheeks, its rounded side towards the front, yellow. Face almost perpendicular in profile, a little convex above the oral margin. Front black, with an interrupted abbreviated, yellow arcuate spot above the antennæ in a reddish brown field. Eyes separated by the width of one eye. Posterior orbits black with yellowish pollen bordering the eyes. Pile short, sparse, pale whitish, confined to the cheeks and posterior orbits. Antennae black, the first joint luteous on the basal half. Antennal process oval, very short, luteous about the antennal base.

Thorax dull black, finely scrobiculate, with inconspicuous short black hairs; the humeri, a cordate spot in front of the suture at the sides, a vitula running from the post alar callosities to the suture and curving inwards about

the middle, a small spot inside its anterior end, an elongate spot on the mesopleura and a small roundish one below, yellow, pleuræ shining. Scutellum yellow, its base and sides black.

Abdomen shining black, with short inconspicuous black pile, the fourth segment with yellow pile, and longer yellowish pile on the sides of the basal two segments. Second segment much narrowed basally, forming a rounded sub-carinate swollen area at the base above; on each side with an elongate basal spot. Second to fourth segments with the apices yellow, the anterior yellow band broadest, that on the fourth segment narrowest; in addition, on each side of the third and fourth segments a yellow U, the convexity behind, those on the third segment with the inner arm obsolete.

Legs black; trochanters and base of femora, ends of femora and broad bases of the tibiæ and their apices, and the first two or three joints of the front four tarsi, yellow or luteous; femora with double rows of small spines on apical half or quarter.

Wings hyaline, brown in front, more yellowish basally, third vein with a long stump of vein into the first posterior cell about its middle; the brown color extends further into the first posterior cell beyond this stump of vein.

Holotype, female, Orillia, Ontario, May 30, 1920, collected by the author and in his collection.

Ceria cylindrica, new species.

Length, 15mm. Male. Eyes over twice as high as wide; abdomen black, with broad yellow segmental apices and elongate yellow triangular spot on each side of the second segment, reaching almost to the yellow apex.

Male. Face and front yellow, the former separated from the latter by a slightly darker curved line reaching from antennal base to the eyes. Face with a median brown stripe enclosing a narrow yellow line, and the antennal process brown; cheeks shining black, narrowly connected along oral margin with median brown stripe. Face in profile conically produced downwards, very gently convex; the apex of the oral margin is almost as far below the lower border of the eyes as the antennal process is above. Antennal peduncle broadest at apex when viewed dorsally, with a shallow longitudinal median line and a sub-apical depression or groove; not as long as broad; viewed laterally it is slightly longer than broad, being compressed, so that it is about one-third as thick when viewed laterally as dorsally. Antennae opaque brown, third joint opaque black, style yellow, with silvery pubescence, first joint obscurely luteous basally, longer than the second, third joint slightly shorter than the second. Vertical triangle yellow, the ocellar tubercle black; posterior orbits black with yellow pollen along the eyes; pile, only on cheeks and posterior orbits, sparse, yellow, shorter above.

Thorax finely scrobiculate, with extremely short black pile, slightly shining black; the humeri, a spot at each end of the suture, a small, indistinct spot on each side of the middle of the suture; a stripe running from the post alar callosities almost to the suture, the mesopleura and a spot below, yellow, post alar callosities reddish, with yellow pile; pleurae with inconspicuous yellow pile.

Scutellum yellow with a complete border of black, slightly over twice as wide as long.

Abdomen slightly shining black, finely scrobiculate; first and second segments fused, with short black pile on the disc and yellowish pile on the sides; on the sides with an elongate yellow triangle reaching almost to the yellow hind margin, the inner points well separated. Apices of the two following segments increasingly broadly yellow, the yellow on the fourth segment occupying nearly one-third the segment, its anterior angle being bi-convex on each side of the median notch; pile yellow; on each side of the third and fourth segments a moderately prominent gray pollinose stripe reaching from near the median anterior portion of the segment to a point about one-third from the apex and one-fourth from the lateral margins. Hypopygium black, with black pile. In outline the abdomen is slightly narrowed to the apex of the first segment, thence gradually widened to the apex of the fourth, where it is about the same width as at the base. The fifth segment and hypopygium are almost concealed by the fourth segment.

Legs reddish yellow, the last two or three tarsi joints brownish; apical half of hind femora and a broad pre-apical band on the hind tibiae brownish. Wings pale brownish anteriorly, hyaline posteriorly.

Holotype, male, "Fallen Leaf;—L. Tahoe, Cal., July 15, 1915," (E. C Van Dyke,) in the Museum of the California Academy of Sciences.

THE CANADIAN SPECIES OF THE GENUS ANOMOGYNA (LEPID.)

BY J. McDUNNOUGH, PH. D.,
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Omitting the two North American species *infimatis* Grt. and *vernilis* Grt., which may in any case prove to be not strictly congeneric, the genus *Anomogyna* Staud. has been employed by Hampson (1903, Cat. Lep. Phal. Brit. Mus. IV., 588) for a few subarctic European species of Agrotinæ of considerable rarity.

Two of these species, *laetabilis* Zett. and *sincera* H.S., have long been placed on our North American lists as occurring in Labrador, presumably on the strength of H. B. Moeschler's identification, who in his time was in receipt of large collections from this region. To North American lepidopterists, however, the species have remained practically unknown until of quite recent years.

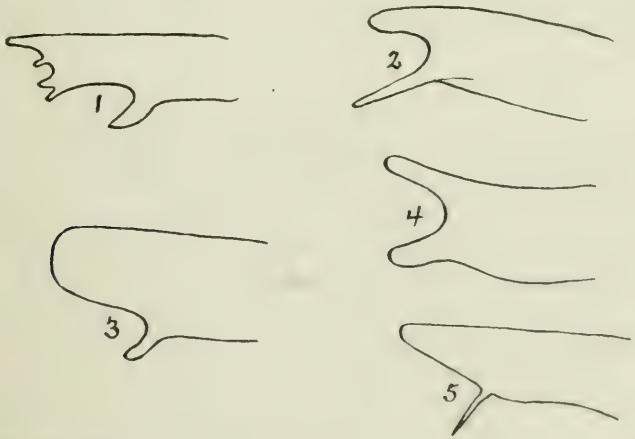
The examination of a series of specimens of this group from the Barnes Collection and that of Mr. K. Bowman of Edmonton, together with specimens contained in the Wolley-Dod and the Canadian National Collections, shows conclusively that there are more species belonging to the group in North America than has been supposed and that these species can be very readily separated from one another by the terminal portion of the claspers (valvæ) of the male genitalia.

As defined by Hampson *Anomogyna* Staud. (type *laetabilis* Zett.) differs from *Aplectoides* Butl. (type *condita* Gn.) in the absence of spines on the fore tibiae. According to the male genitalia there is evidently a close relationship between the species of *Anomogyna* and certain ones included by Hampson in *Aplectoides,* notably *speciosa* Hbn. and *imperita* Hbn., and it is a matter of considerable doubt to me whether in these cases the generic separation will hold;

*Contribution from the Entomological Branch, Dept. of Agriculture, Ottawa.

In this connection I might mention that while the fore-tibial spines are quite clearly seen in European specimens of *speciosa* and its race *arctica*, in several North American specimens from Mt. Washington, N.H., before me I have been quite unable to detect them although the genitalia present no differences which would indicate specific distinctness.

It is further of interest to note that *Aplectoides* Butl. may possibly fall to *Pteroscia* Morr. (1874, Proc. Bost. Soc. Nat. Hist., XVII., 155). This genus was based on the single species *atrata* Morr. from Mt. Washington, N.H., a species omitted by Hampson in his catalogue and wrongly included under *Agrotis* in the Barnes and McDunnough Check List, 1917, on account of the superficial resemblance to the *unimacula* group. An MSS. note by Dod, who carefully examined the British Museum specimen, states that the species looks like an Alpine *Aplectoides* and is closely related to *speciosa;* this reference I thoroughly agree with after an examination of a ♀ specimen recently received by the National Collection from Larder Lake, Ontario, and which seems to be an undoubted *atrata*. If *condita* and *atrata*, the types of the two genera in question, prove congeneric, *Pteroscia* will have priority. The correct generic relationships of the entire Agrotid group require however a much more detailed study than I now am able to give and I shall confine myself in the present paper to a few remarks on the various species.



Terminal portion of right claspers of (1) *A. partita* n. sp. (2) *A. sincera* H.S. (3) *A. homogena* n. sp. (4) *A. lactabilis* Zett. (5) *P. yukona* n sp.

A. sincera H. S.

I have recently recorded (Can. Ent. liii., 84) the receipt of a very fine male specimen from Hopedale, Labrador, which is now in the National Collection, through the kindness of Dr. E. M. Walker. It matches so excellently the figure given in Seitz, Macrolepidoptera, Fauna Palaearctica, Vol. III., Pl. XIII. k, that even without European material for comparison I feel reasonably sure of the identification. A single worn specimen labelled Labrador is in the Barnes Collection ex. Coll. J. Doll, and very possibly was the one examined by J. B. Smith in his Agrotid revision, as it is evidently from a German collector and has had a portion of the left clasper removed, as was Smith's custom. Mr. Bowman

possesses a very fine specimen from Nordegg, Alta., and a worn one captured at Pocahontas, Alta.; the species may therefore be expected to occur throughout the entire northern portion of Canada. The terminal dorsal portion of the left clasper is narrow and rounded; the ventral edge is terminated by a long, sharp spine (fig. 2).

A. laetabilis Zett.

Of late years the species has not been rare. It was first reported from Atlin, B.C., by E. M. Anderson, who collected in this region in 1914 (Rep. Prov. Mus. B.C. for 1915, 17, Pl. IX., figs. 9, 10).

Since then numerous specimens have been received by Dr. Wm. Barnes from Okak, Hopedale and Nain, Labrador, and several specimens were collected by Mr. J. B. Wallis, of Winnipeg, in 1917 on the Piquitenay River, Mile 214, Hudson Bay R. R. A very large specimen, rather browner than usual, is contained in the Dod collection from St. Anthony, Newfoundland. Messrs. Bowman and Whitehouse have each taken single specimens in tamarack swamps at Nordegg and Reddeer, Alta., the latter specimen being similar to the Newfoundland one.

These specimens all agree in genitalic characters with a Lapland specimen in the Dod Collection; the distal portion of the clasper is bifid (fig. 4), each prong being bluntly rounded terminally; the ventral prong is generally somewhat shorter and broader than the dorsal one, but there is some variation in this respect.

A. homogena n. sp.

Primaries rather even gray-brown with a slight purplish tinge; a distinct black basal dash reaching 2/3 to t. a. line; basal half-line geminate, filled with pale gray, indistinct except at costa; t. a. line geminate, gray-filled, outwardly oblique and prominent from costa to proximal end of orbicular, bent inward at cell and then forming two prominent outcurves in submedian fold and above inner margin with inward angle on vein 1; orbicular large, oval, recumbent, filled with pale gray and partially outlined in black in ♂ sex, preceded and followed by black shades in cell; reniform moderate, outlined in black, centrally filled with same shade as the ground color of wing, outwardly with paler ring of color; claviform outlined in black, not prominent; a faint median shade line passing between reniform and orbicular and then bent slightly inward; t. p. line geminate, dentate, pale filled, arising from dark spot on costa above reniform, well rounded outwardly opposite cell and then rigidly oblique to inner margin; s. t. line pale, angled outwardly below costa, then slightly sinuous, preceded below costa by several blackish dashes; similar dashes occur between veins 4 and 6 and slightly below 2; considerable pale gray shading in subterminal area and at apex of wing; broken blackish terminal line. Secondaries deep smoky, paler basally, with large discal spot and traces of curved median line; fringes paler. Beneath smoky with discal spot and curved median line on both wings. Expanse 38-40 mm.

Holotype, 1 ♂, Banff, Alberta, (Sanson), September 5, 1911, in Canadian National Collection.

Allotype, 1 ♀, Pocahontas, Alberta (K. Bowman), August 24, 1918, in Coll. Barnes.

Paratype, 1 ♂, Pocahontas, Alberta (K. Bowman), August 17, 1916, in Coll. Barnes.

A series of five specimens from Nordegg, Alta., is contained in the Bowman collection.

This species has been doubtfully recorded by Wolley-Dod (Can. Ent. XLVII., 7, 1915) under the name *gelida* var. *mevesi* Auriv. I have seen no authentic specimens of this race, but judging by existing figures hardly believe that the two forms are identical. The ♂ genitalia (fig. 3) are quite distinct from those of the two preceding species and closest superficially to those of *Aplectoides speciosa;* the clasper is broad and rounded distally and on the ventral surface a short distance anterior to the apex bears a thumb-like projection considerably larger than the similar projection found in *speciosa.*

Anomogyna (Aplectoides) beddeki Hamp.

Through the kindness of Mr. W. H. Tams of the British Museum I have received a sketch of the clasper of the ♂ type of this species; the terminal portion ends in a rather blunt point with a thumb-like projection on the ventral margin near apex; between this and the end of the clasper there are several irregular projections.

The unique type came from Doyles Cadroy valley, Newfoundland, and it is quite possible that the name *beddeki* will fall to *livalis* Sm. (1910, Jour. N.Y. Ent. Soc., XVIII., 86), also described from Newfoundland. Smith's species is, however, entirely unknown to me and until an opportunity of studying the type is presented it would be unsafe to cite the two names as synonyms. Judging by genitalia I believe I have found a specimen of *beddeki* mixed in with a small series of *speciosa* in the Dod Collection from Grand Gulf, Mt. Washington, N.H. (Swett). The specimen is considerably worn, but shows the small orbicular mentioned by Hampson, which, apart from genitalia, seems the best means of separation from the very similar *speciosa* form of the White Mts.

Five specimens before me from the Rocky Mts. are evidently very closely allied to *beddeki* Hamp. They differ, however, in the lack of any definite white shading on the primaries, especially in the terminal area, being rather uniformly dark olivaceous-gray with the filling of the ordinary spots slightly paler in color than the surrounding area; there is also no evident black basal streak. It is quite possible that these represent merely a western race of *beddeki,* as the type of genitalia is essentially similar, the claspers only differing in the minute detail of the apical margin, which is apparently by no means constant. Until more material is available for study I shall regard the above characters as being of good specific value.

A. partita n. sp.

Squammation rough, hairy. Primaries deep smoky, heavily overlaid, especially in median area, with pale olivaceous scaling amongst which are scattered black scales. Basal half line indistinct, black, bordered outwardly with pale olivaceous; t. a. line black, outwardly oblique and rather irregular from costa to submedian fold, then bent inward and forming a prominent inward angle on vein 1, broadly edged inwardly with pale color; orbicular small,

round, edged with black, pale-filled; reniform semilunate, edged with black, pale-filled; claviform a minute black loop; t. p. line strong, dentate, black, edged outwardly by pale color, bent outward below costa, then rather rigidly oblique to inner margin; s. t. line defined by paler terminal shading and preceded by dark dashes which form opposite cell a distinct dark patch; broken dark terminal line and checkered fringes. Secondaries smoky, paler basally with dark discal dot and traces of curved median line; terminal dark line, slightly broken; fringes pale. Beneath dull smoky with indistinct broad curved median shade on both wings as well as discal dots. Expanse 36-38 mm.

Holotype, 1 ♂, Banff, Alberta (J. B. Wallis), July 4th, in Canadian National Collection.

Paratypes, 2 ♂'s, Kaslo, B. C., July 24th, Aug. 7th (J. W. Cockle), in Canadian National Collection and Collection of Mr. Cockle. 2 ♂'s, Nordegg, Alta., June 23rd, July 20th (J. McDunnough), in Canadian National Collection. Several other specimens from Nordegg are in the Bowman Collection.

The species is superficially similar to *speciosa* Hbn., but quite distinct in genitalia; in the holotype the distal end of the clasper (fig. 1) is drawn out to four points, of which the dorsal one is longest, and on the ventral margin a short distance from apex the clasper is furnished with a blunt curved projection somewhat similar to that of the preceding species; in the paratypes the middle teeth are reduced to mere knobs and the apical margin is shorter and more oblique, much closer in general appearance to the clasper of *beddeki* Hamp. The fore tibiae show only one or two spines in the distal area.

Among the specimens sent by Dr. Wm. Barnes were two specimens from Upper Ramparts, Yukon Territory, which are quite obviously allied to *atrata* Morr, and which apparently represent a paler, northern race of this species as I can detect no differences in the shape of the terminal portion of the clasper of the two forms.

Pteroscia atrata yukona n. var.

Fore tibiae spined. Thorax an admixture of brown and gray scaling. Primaries rather light purplish-brown, distinctly shiny; maculation rather indistinct; t. a. line slightly darker than ground color, defined inwardly by pale ochreous shading, most prominent as a pale costal patch, slightly dentate in cell, well outcurved in submedian fold, angled inwardly on vein 1; orbicular minute, indistinct, pale-filled; reniform small, narrow, lunate, pale-filled; t. p. line prominently dentate, edged outwardly with pale ochreous, well rounded opposite cell and bent inward in submedian fold, approaching t. a. line closely at inner margin. Several pale dashes on costa between t. p. line and apex of wing and pale terminal dots on outer margin at extremity of veins; fringes concolorous. Secondaries pale smoky with faint discal dot and dark terminal line. Beneath pale smoky, primaries with noticeably darker fringes broken by pale dots, secondaries with dark terminal line; traces of discal dots and bent median line on all wings. Expanse 37 mm.

Holotype, 1 ♂, Upper Ramparts, Yukon Terr. (June 8th, 1917), in Collection Barnes.

Paratype, 1 ♂, Upper Ramparts, Yukon Terr., (July 17, 1917), in Canadian National Collection, through courtesy of Dr. Barnes.

The variety is much paler than the type form, which is purplish-black in color. The ♂ clasper (fig. 5) narrows rapidly at its distal end and bears a strong spine-like projection on its ventral side shortly before apex.

NOTES ON THE MORDELLIDAE OF THE UNITED STATES, WITH DESCRIPTIONS OF NEW SPECIES.

BY EMIL LILJEBLAD,
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Note on sexual dimorphism in the Mordellidae.—Not only in *Tomaxia,* as described by Mr. C. A. Frost,* but also in many (and probably all) the species of *Mordella* and *Mordellistena,* a comb-like series of coarse setae is developed in each anterior femur of the male only. In all Mordellidae studied by the writer in this regard, the males are somewhat smaller and notably slenderer than the females. In at least two species of *Mordellistena* (*M. syntaenia* and *M. pulchra,* as described below), there exists a sexual difference in the number of tibial ridges. In some species of the family, for example *Mordellistena pulchra* (q.v.), the sexes further differ in color.

1. **Diclidia inyoensis,** sp. nov.

Body elongate, nearly parallel in the male, more robust in the female; finely transversely-strigate. Head dark reddish-brown, mouth-parts fusco-testaceous, dark brown palpi excepted; eyes black; antennae reddish-brown, a little lighter toward the base; prothorax and elytra dark reddish-brown; under surfaces dark brown, except the prosternum in the male, which is much lighter in color; legs testaceous in male, fusco-testaceous in female. Eyes granulate and rather deeply emarginate. Antennae with the first and second joints about equal in length, each one-fourth shorter than the third, which is a little shorter than the fourth, in the male; the third and fourth joints equal in the female, of about the same length as the second; sixth to tenth joints in both sexes about equal, each widening toward apex, and each shorter than the fifth; eleventh joint pointed at tip, twice as long as the tenth. Prothorax one-third wider than long, widest at base, its sides rapidly converging to apex, mesosternum compressed and slightly elevated; elytra as wide as thorax at base, rather abruptly rounded at apex, especially in the male; sixth ventral segment visible. The males have on each side of the oedeagus, a rather long flattened, triangular appendage, rounded at apex, and with several setae (this, however, can only be seen if the genital organ is extruded). Length of male , 2mm.; of female, 2.25 mm. Breadth of male, 0.75 mm.; of female, 1.0 .

Eight specimens examined, all from the Inyo Mountains, California, at an elevation of 7,000-9,000 feet; collected on July 7-11 by Prof. H. F. Wickham. The male holotype and female allotype are deposited in the writer's collection; paratypes in the collection of Prof. H. F. Wickham, from whom the specimens were received.

This species somewhat resembles *Anthobates fusculus* Lec., but the antennae are longer, and the third and fourth joints are about equal in length, the fourth not being reduced in size as it is in *Anthobates.*

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*Ent. News, XXIV., 1913, p. 127.

2. **Diclidia gilva,** sp. nov.

Body subcuneate, nearly parallel; color entirely fulvous, except on the black eyes and the fuscous abdomen, finely transversely-strigate. Head comparatively large; eyes coarsely granulate and rather deeply emarginate. Antennae with the second joint a little shorter than the first; the third and fourth equal in length, each about as long as the first and second together; the fifth one-third shorter than the fourth; the sixth a little shorter and wider than the fifth; the eleventh joint twice as long as the tenth. Prothorax about one-third wider than long, as wide as the elytra at base; its sides converging toward the apex; mesosternum compressed and much elevated; elytra slightly tapering toward the apex and rounded at tip; sixth ventral segment visible, nearly truncate, or very slightly emarginate at apex. Two short and narrow appendages, pointed at tip, and covered with comparatively long setae, developed at tip of abdomen, presumably part of the oedeagus, as in *Diclidia inyoensis*. Length 2.5mm., breadth 1 mm.

Two specimens examined, both males, collected on the Inyo Mountains, California, at an elevation of 7,000-9,000 feet, on July 7-11, by Prof. H. F. Wickham.

The type is in the possession of the writer, the paratype is in the collection of Prof. H. F. Wickham.

This species is most closely related to *Diclidia greeni* Liljeblad,[1] from whcih it differs slightly in size and color, and notably in the shape of the abdominal appendages.

3. **Mordella pubescens,** sp. nov.

Body moderately elongate, very slightly cuneiform; entirely covered with rather coarse, stiff, sericeous-cinereous pubescence. Ground color mostly black, but the elytra with a double whitish spot, located at one-third the distance from apex to base. Head very finely punctate. Antennae short, not reaching middle of prothorax; third joint one-fifth longer than the fourth; the fifth, one-fifth longer than the fourth, but nearly twice as broad at apex, being strongly clavate; the sixth to tenth joints about equal in length, each being one-fourth shorter than the fifth, and strongly clavate; the eleventh joint one-third longer than the tenth, its sides slightly converging toward the apex. Last joint of maxillary palpi an isosceles triangle. Prothorax one-third broader than long, a little broader than the elytra at base; evenly rounded from base to apex, its hind angles obtuse, finely punctured, slightly canaliculate in the middle near the apex and with a very faint fovea each side of it; its base in front of scutellum very broadly rounded; scutellum triangular; under surfaces finely punctured. Anal style very short, comparatively broad, and blunt at tip. Length to end of the elytra 6 mm., to tip of the anal style 7 mm.

One specimen only, presumably a male, from Littleton, Colorado, collected on June 4 by Mr. C. A. Frost.

This species is most nearly allied to *Mordella quadri-punctata* Say., from which it differs markedly, in the much shorter form, and in the color of the elytral pubescence, which is brownish in *M. quadri-punctata*.

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[1] Can. Ent. L, 1918, p. 153.

4. **Mordella obliqua** Lec.

The writer is of the opinion that this species, being valid, was wrongly placed by Smith[2] in the synonymy of *M. lunulata*. Three specimens agreeing closely with the original description[3] have been examined; two of these are topotypes, collected by Mr. H. Dietrich at Odenton, Maryland, on June 16; the third was collected by Mr. T. H. Hubbell at Sawyer Dunes, Berrien County, Michigan, on July 9. These three differ from specimens typical of Helmuth's *lunulata*,[4] in the form of the body, and of the anal style; in the relative lengths of the antennal segments; in the character of the pubescence, and in the marking of the elytra. As originally stated, *M. obliqua* bears considerable resemblance to *M. marginata*.

Mordella obliqua may be redescribed, on the basis of the material at hand, as follows:

Body short, elongate-oval in form. Color as originally described, except that the pubescence of the under surfaces is cinereous, and that the pubescence at the sides of the abdominal segments and of the pygidium is silvery; antennae and palpi, dark brown, palpi the lighter of the two. Antennae with third joint very little shorter than the fourth, and less dilated at apex; fifth joint one-third longer than the fourth and twice as broad at apex; sixth to tenth joints each about one-fourth shorter than the fifth, all moderately serrate. Last joint of maxillary palpi with the inner and outer sides nearly equal in length, the basal side one-half shorter.

5. **Mordellistena quadrinotata, sp. nov.**

Hind tibia with two oblique parallel ridges, the anterior one extending entirely across the outer face of the tibia; first joint of hind tarsus with three, second with two ridges; all ridges strongly marked.

Form nearly linear. Head testaceous, sparsely covered with cinereous pubescence; antennae testaceous, becoming a little fuscous on the four terminal joints; palpi a little darker than the head; eyes black; prothorax black with long flavo-testaceous pubescence, and a small ferruginous spot at the apical angle on each side; elytra black, with an oblique, oblong oval testaceous spot, extending from the humeral angle one-third of the distance to tip of elytra, but not reaching the suture, and one small pale spot, located in the middle of each elytron, one-third of the distance from its apex to base; surface of elytra covered with long stiff flavo-testaceous pubescence; under surfaces black, except on the two last segments of the abdomen (which are testaceous), with pubescence like that of the elytra; anterior legs testaceous, femora and tibia of posterior legs black, the tarsi fuscous; anal style testaceous. Head a little narrower than the prothorax, finely punctured Antennae filiform; covered with bristle-like hairs; the first and second joints equal in length, rather robust; the third and fourth joints each one-third shorter and a little narrower than the second; the fifth to tenth joints about equal in length, each one-third longer and wider than the fourth; eleventh joint oval, longer than the tenth. Palpi with the last joint nearly oval. Prothorax finely and sparsely punctured; about as long as wide, widest a little in advance of the base, which is truncate in front of scutellum; its sides slightly

[2] Trans. Am. Ent. Soc. X, 1882, pp. 81, 83.

[3] Proc. Amer. Philos. Soc. XVII., 1878, p. 428.

[4] Specimens examined from Iowa, Illinois, Ohio, Maryland, New Jersey, New York and Massachusetts.

converging toward the apex. Elytra nearly parallel on anterior two-thirds, tapering thence to apex; rather coarsely scabrose over the entire surface; anal style 3 mm.

A single specimen, presumably a female, collected by the writer at Miller, style long and slender. Length to end of the elytra, 2.5 mm., to end of the anal Indiana, on August 29, retained in the writer's collection.

This species seems most nearly allied to *Mordellistena semiusta* Lec., differing in having the prothorax black, with a small ferruginous spot on the apical angle; in having the humeral spot on the elytra distinct, and in the development of a subapical pale spot. It should be listed immediately following *Mordellistena ustulata*..

6. **Mordellistena syntaenia,** sp. nov.

Hind tibia with two ridges in male, with three in female; first joint of hind tarsus with three, the second with two ridges in both sexes; all ridges short and somewhat indistinct.

Body linear. Head black, with rather long and coarse sericeous-cinereous pubescence; antennae black, with the four basal joints fusco-ferruginous; mouthparts fusco-ferruginous; prothorax black, with rather long coarse sericeous pubescence; elytra black, each elytron with two sericeous-cinereous stripes or vittae; one located near the suture, widening basally and there dividing to enclose a narrow black streak in the center; the other vitta narrow, located near the margin, connected with the first at the base and apex, enclosing a broad black space on the disc, and leaving the suture and lateral margin black; under surfaces black, covered with cinereous pubescence; anterior legs ferruginous, becoming fuscous on apex of the femora and tarsi; middle legs a little darker; posterior legs black, becoming ferruginous on the tibial spurs. Head a little narrower than thorax, closely and finely punctured. Antennae filiform, reaching nearly to base of thorax; the first and second joints equal in length; the third a little shorter than the second; the fourth one-third longer and a little broader than the third; the fifth one-third longer and a little broader than the fourth; the sixth to tenth joints about equal in length; the eleventh longer than the tenth. Apical joint of maxillary palpi securiform; prothorax about as long as wide, its base as wide as that of the elytra, widest at middle, its sides evenly rounded and slightly converging to apex; base truncate or very slightly emarginate at middle; elytra widest at middle and slightly tapering to apex, finely and closely punctured. The inner edges of the femora and tibiae of the anterior legs bear long erect setae in the male, but only fine hairs in the female; inner spur of posterior legs one-third longer than the other. Anal style long and slender. Length to end of the elytra 3 mm., to end of the anal style 4 mm.

Twenty-three specimens examined: nine from Duxbury, Mass., June 27; four from Framingham, Mass., June 3 to July 4; six from Sherborn, Mass., May 25 to June 22; one from Natick, Mass, June 20; two from Southboro, Mass., June 9, and one from Dummerston, Vt., July 14, all collected by Mr. C. A. Frost. The male holotype and female allotype, from Duxbury, Massachusetts, are placed in the writer's collection; paratypes in the collection of Mr. C. A. Frost.

The species is unlike all other North American forms of the genus, being

readily distinguishable by the elytral markings and the ferruginous anterior legs. The ridges on the posterior legs vary much in size, in many specimens being small and faintly indicated; some specimens show slight indications of rudimentary additional ridges.

On account of the sexual difference in the number of ridges, the writer suggests that this species be placed in taxonomic sequence after *Mordellistena inornata.*

7. **Mordellistena incommunis,** sp. nov.

Hind tibia with three rather strongly marked oblique ridges; first joint of hind tarsi with four, the second with three, small oblique ridges.

Body linear, slightly cuneiform. Color black, showing in certain lights a blueish-green iridescent lustre; head and prothorax rather sparsely covered with yellowish-brown pubescence; antennae black; elytra with golden-yellow pubescence along the suture, and on a rather broad vitta on each elytron, extending from near the humeral angle to a little beyond the middle; under surfaces black, with sparse yellowish-brown pubescence; legs black. Head a little narrower than prothorax, finely punctured; eyes small. Antennae filiform, or slightly serrate; third joint one-fourth shorter and a little narrower than the fourth, fifth to tenth joints nearly equal in length and width, each being very little longer than the fourth; eleventh joint elongate ovate, one-fourth longer than the tenth. Maxillary palpi scalene-triangular. Prothorax finely punctured, as broad as long; widest one-fourth the distance from base to apex; slightly rounded and converging toward apex; the base at middle (in front of scutellum), truncate; scutellum triangular; elytra very little wider than the prothorax, widest at middle, and slightly tapering toward apex; moderately punctured. Inner edge of femora and tibiae of anterior legs with long setae in the male, finely pubescent in the female. Anal style long and very slender, with cinerous pubescence at base. Length to end of the elytra, 3.5 to 4 mm., to end of the anal style 4 to 5 mm.

Four specimens examined: one from Riverside, near Chicago, Illinois, collected on June 27 by Mr. C. Sellinger; one from Sawyer Dunes, Berrien County, Michigan, collected by Mr. T. H. Hubbell, and two from Aweme, Manitoba, Canada, collected on June 19 Mr. Norman Criddle. The male holotype from Riverside, Ill., is deposited in writer's collection; the female allotype from Sawyer Dunes, Berrien Co., Mich., will be placed in the Museum of Zoology, University of Michigan; a paratype in Mr. Criddle's collection.

This species somewhat resembles *Mordellistena suturella* Hel., but differs in having the fourth to tenth antennal joints much shorter, and slightly serrate, rather than elongate-parallel, and in coloration *suturella* shows no trace of a vitta on the disc of the elytra. It should be placed after *Mordellistena aequalis, M. conformis* or *M. pulchra,* all of which have same number of ridges on hind legs.

8. **Mordellistena pulchra** Liljeblad.

Since the publication of the original description[5] of this species, the writer has collected twenty-five additional specimens, including males, which have not been described.

5 Can. Ent. XLIX., 1917, p. 12.

These specimens were taken from flowers of Helianthus, on August 17 and September 6, at Edgebrook, Illinois, near the type-locality of the species.

The two sexes differ very markedly in several respects. The ridges are alike in the two sexes, except that the second joint of the hind tarsus bears two, rather than three, oblique ridges; in some males a rudiment of the third ridge can be distinguished. The males are somewhat darker in color than the females; the prothorax is ferruginous rather than rufous; the median black line is shorter, being restricted to the posterior half of the prothorax; the elytral vitta is narrower and fainter, in some specimens being apparent only at base of the elytra. The inner edge of the anterior femora in the male only bears setae. The males are somewhat shorter and notably slenderer than the females.

NOTES ON THE GENUS GARYPUS IN NORTH AMERICA. (PSEUDOSCORPIONIDA—CHELIFERIDAE.)

BY JOSEPH C. CHAMBERLIN,
Stanford University, California.

In studying a small collection of these interesting arachnids from the California Academy of Sciences, kindly loaned through the courtesy of Dr. E. P. Van Duzee, I discovered a large *Garypus* from Lower California which is apparently undescribed. There were also representatives of *Chelifer* and *Chelanops* which I believe likewise to be new and will describe in a later paper.

To Mr. G. F. Ferris of Stanford University, for his always willing, kindly criticism and help in preparing this description I wish to extend my sincerest thanks.

Garypus giganteus, sp. nov.

Female—(Fig. A) *Measurements.* A large species measuring 7.5 mm. in length, including chelicerae. Other measurements may be tabulated:

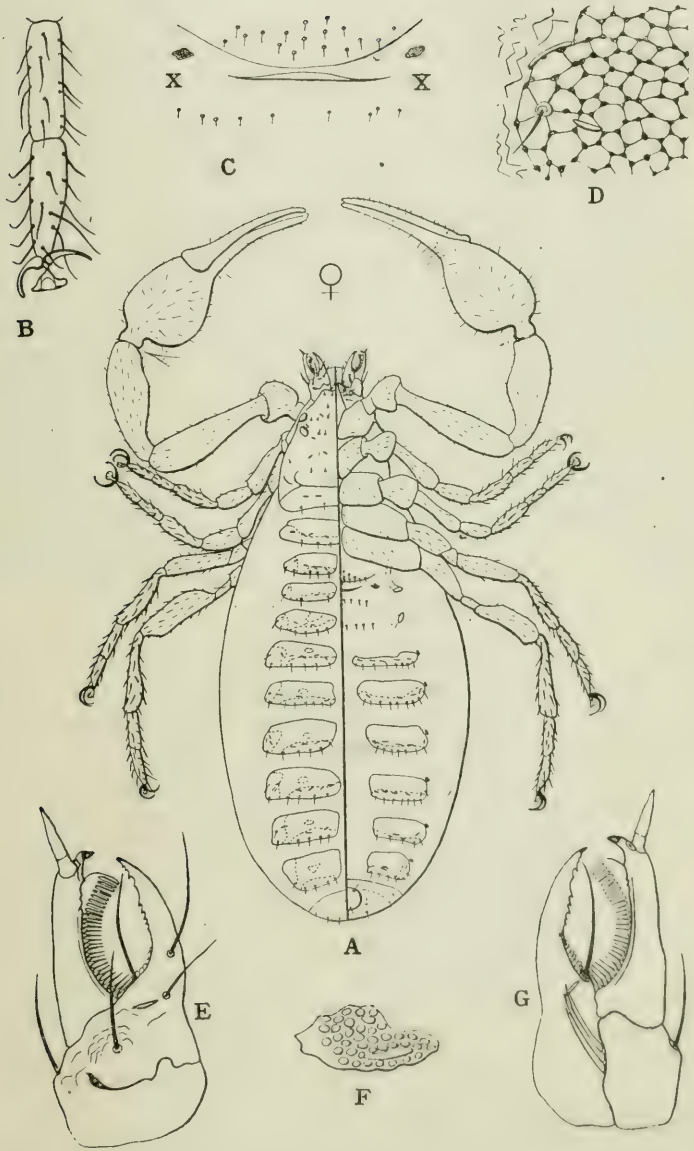
Anterior margin of cephalothorax	.37 mm.
Posterior margin of cephalothorax	1.50 mm.
Length of cephalothorax (exclusive of chelicera)	1.60 mm.
Pedipalps (including coxa)	6.55 mm.
First leg (including coxa)	3.50 mm.
Second leg (including coxa)	3.55 mm.
Third leg (including coxa)	4.40 mm.
Fourth leg (including coxa)	5.10 mm.

The length of the individual palpal joints are: coxa, .5 mm.; trochanter, .5 mm.; femur, 1.75 mm.; tibia, 1.5 mm., and claw, 3.3 mm.

Color. (Alcoholic)—Generally light brownish. Fingers reddish brown; hand light reddish yellow. Remainder of palpi and also legs, light pale brownish. Cephalothorax brown. Abdominal scutae light brown with central darker spot. Ventral abdominal plates light brown; only last seven pairs being visible as the rest are unchitinized and soft. Intersegmental parts and areas surrounding the operculum, very pale brownish.

Morphological characters. Pedipalpi moderately long and slender, sparsely clothed with minute simple hairs; fingers distinctly curved, terminated by a stout tooth and provided along their length with a row of minute teeth or serrations. Hand very convex on the inner margin and shorter than the fingers.

Can.Ent.Vol. LIII. Plate VII



GARYPUS GIGANTEUS, NEW SPECIES

(See Page 191)

Tibia about half the width of the hand, convex on its inner edge, but with a gentle concavity at its distal end. Femur not quite so wide as tibia and about the same length, the inner margin being almost straight. Trochanter almost globular.

Chelicerae—(Fig. E, G). Spinnerets long and almost conical in shape, apparently unbranched, although owing to the method of mounting such branching may have been lost. There appears to be a slight constriction or suture near the base. In the type there may be seen running up the movable finger into the spinneret two and possibly three slender ducts, which are presumably from the silk glands. At the base of, and slightly anterior to, each spinneret is an alveolus from which a seta originally arose but which is lost in the type. The serrula consists of about thirty teeth of which the proximal are longest. Fixed finger with nine small teeth exclusive of the hard chitinized tip. The "fixed finger serrula" is present but rather inconspicuous. On each side of the base appears a prominent "stoma." (See remarks).

Cephalothorax—Rather small, sub-triangular, cephalic border emarginate with an indistinct suture or furrow behind the eyes, which are very bright and prominent. Carapace very finely granulate, sparsely covered with minute hairs and bearing a number of small stomata. On either side of the labium is an irregular group of five good sized bristles or setae. The legs are each composed of seven segments; coxa, first and second trochanters, femur, tibia, metatarsus and tarsus. All segments of the legs except the last three are in each case sparingly clothed with fine hairs, but on the last three segments occur numerous stout setae which are more or less regularly arranged. The claws are long and simple and the empodium prominent. (Fig. B.)

Abdomen—Large and evenly rounded. The scutae, with the exception of the first and last are widely divided by a longitudinal median strip and broad intersegmental areas. The last scuta is not only entire but is continuous with the last ventral scuta as well. All these plates are more or less unevenly chitinized and it is due to this fact that their characteristic patterning appears; the areas of heavier chitinization appearing darker than the rest. (See dotted areas of heavier chitinization in fig. A.) The posterior border of each scuta bears a row of from three to eight short, simple setae and anterior to, and roughly parallel with them occurs a row of from three to eight small stomata. The ventral plates are generally smaller and more weakly chitinized than the dorsal ones and the patterning is also different. Only the last seven pairs are visible, the others being indicated by the rows of setae and the very prominent spiracles. Plainly visible at the anterior distal corner of each ventral scuta except the last are the vestigial stigmata. Just inside the anal opening are two pair of small setae.

Skin—(Fig. D). The structure of the skin forming the scutae is very distinct and gives a very characteristic reticulated appearance.

Operculum—(Fig. C.). Just anterior to the genital slit are three rows of short simple setae which probably indicate the first two abdominal segments. Posterior to the opening is a very long narrow chitinized area, then two separate rows of setae and finally the first of the visible plates. The most distinctive

character of this area is, however, the presence of the well marked "cribriform plates." (Fig. A).

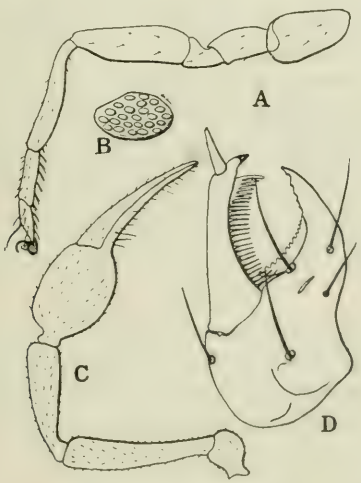
Cribriform Plates—(Fig. F). In this species the cribriform plates are roughly oval or diamond shaped, with about thirty-four "pores" and in addition a small stoma on the posterior edge.

Affinities. This species is rather close to *G. californicus* from which it may readily be separated by its larger size as well as numerous other characters as may be seen by comparing with the brief redescription of the latter species.

Material. A single adult female from Turtle Bay, Lower California, Mexico, collected by the U.S.S. Albatross, April 20, 1906, and deposited in the collection of the California Academy of Sciences, San Francisco, California.

Remarks. The type is mounted on a slide in canada balsam and was first boiled in KOH and stained. Mounting specimens in this way is apt to destroy the shape of the spinnerets, but the numerous characters which are gained more than offset this handicap. Many of the features noted in the preceding description are invisible or practically so in any other form of mount.

In the above description I have used several terms which it might be well to explain. The "fixed finger serrula" referred to is a serrula-like set of transparent teeth or serrations extending from the large seta at the junction of the two fingers along the keel of the fixed finger almost to the basal tooth. I have been unable to find any former mention of this character. It also appears in *G. californicus* where it is very prominent. Its occurrence is very probably generic as is also the characteristic arrangement of the five large dorsal setae. (Figs. E, G and text fig. D).



Garypus californicus (Banks). Female.
A—Third leg. B—Cribriform plate. C—Pedipalp. D—Dorsal aspect of chelicera.

At the base of the fixed finger of the chelicerae on both dorsal and ventral sides, is a long slit-like opening, which, from its resemblance to a superficially similar structure in plants, I have termed a "stoma." These stomata are characteristic of all the species of the order which I have studied and are to be found almost anywhere on the chitinized areas of the body, but more particularly on the abdominal scutae. What they really are I have been unable to discover.

but possibly the openings of lyriform organs or, perhaps, glands. While characteristic of all the species they vary greatly in size, number and position according to the species. They are very probably variable within certain limits in the species also, at least I would suspect so judging from studies of *Chelifer scabriculus* and *C. fuscipes*.

The structures which I have referred to under the term "cribriform plates" are small chitinized plates which are apparently perforated with numerous pores. They occur near the genital slit of the *females* of various species in the family Cheliferidae and vary greatly in size, shape and degree of chitinization. I have found them most prominent in *Chelifer scabriculus* where they are almost perfectly round and rather close together. Whether they occur in other families I cannot say as I have not seen enough material to judge.

Garypus californicus (Banks).

1909—*Garypus californicus* (Banks), Can. Ent. 41:305.

1911—*Garypus californicus* (Banks), Pom. Jour. Ent., 3:635:f210-B.

1917—*Garypus californicus* (Banks), Moore. Jour. Ent. Zool., 9:26:1.

Pedipalps—(Text fig. C). Palpi have almost same proportions as in *G. giganteus*, but the inner margin of the hand is not so swollen, the inner margin of the tibia is straight as is also the inner margin of the femur.

Chelicerae—(Text fig. D). The spinnerets are long conical and as in *G. giganteus* apparently unbranched, the serrula has about twenty-five teeth, the fixed finger is very strongly curved, and the fixed finger serrula is very prominent, having about twelve or thirteen teeth.

Cephalothorax and legs—(Text fig. A). Cephalothorax sub-triangular with anterior border emarginate. Legs as in *G. giganteus* all composed of seven segments. In this species the tarsal bristles are arranged in regular rows. The change from sparsely scattered fine hairs to these tarsal setae takes place at the metatarsus, unlike *G. giganteus* where the transition is at the tibia.

Abdomen—Much the same shape as in *G. giganteus* except that all the ventral scutae are slightly more chitinized. The cribriform plates (Fig. B) are oval in shape, with about twenty-three pores and no stoma.

Material. An adult female from the type locality; Santa Clara County, California.

Remarks. In several places I have noticed descriptions of species in this genus where the fact is mentioned that the second trochanter is present in the posterior pair of legs, inferring that they were missing in the two anterior pair. I think this is a mistake as in both these species the number of segments is the same in all the legs.

Other North American Species.

Two other species of this genus are described from North America. These are *Garypus floridensis* and *G. granulatus*, both of which were described by Dr. Nathan Banks. The four North American species may be separated by the following key, which is based in part upon the literature.

1. Anterior margin of cephalothorax emarginate, fingers as long or longer than hand, length 4 mm. or greater 2
   Anterior margin of the cephalothorax not emarginate, fingers shorter than

hand, length 1.7 mm. . . . . *granulatus* (Banks)

2. Fingers about as long as hand, length 4 mm. . . . . *floridensis* (Banks)
   Fingers distinctly longer than hand, Pacific Coast species 3
3. Inner margin of tibia straight, fixed finger of chelicera strongly curved, fixed finger serrula very prominent, cribriform plate of female oval in shape and lacking a stomata, length 4.5 mm. . . . . *californicus* (Banks)
   Inner margin of tibia convex, fixed finger of chelicera almost straight, fixed finger serrula inconspicuous, cribriform plate of female roughly angular with a small stoma present, length 7.5 mm. From Lower California. . . . . *giganteus* sp. nov.

Garypus floridensis (Banks).

1895—*Garypus floridensis* (Banks), Journ. N. Y. Ent. Soc., 3:9.

This species was described from near St. Lucie, Indian River, Florida, where it was collected under drift-wood on the ocean beach.

Garypus granulatus (Banks).

1891—*Garypus granulatus* (Banks), Can. Ent., 23:163.

1895—*Garypus granulatus* (Banks), Journ. N. Y. Ent. Soc., 3:9.

This small species was discovered in the crevices of a cliff at Ithaca, N.Y.

EXPLANATION OF PLATE VII.

A—Left half dorsal; right half ventral.
B—Dorsal aspect of tarsus of second leg.
C—Operculum.
D—Distal corner of third dorsal scuta.
E—Dorsal aspect of chelicera.
F—Cribriform plate.
G—Ventral aspect of chelicera.

SAMIA EURYALUS BDV., THE CORRECT NAME FOR THE CALIFORNIAN SILK WORM MOTH.

BY J. McDUNNOUGH, PH. D.,*
Entomological Branch, Ottawa.

A curious error has crept into the synonymy of the well-known *Samia* species of California and the Pacific Coast which, for the past fifteen years, has been generally known as *Samia rubra* Behr.

The species was first mentioned by Dr. Behr at the meeting of the California Academy of Sciences held April 30th, 1855, and is reported in the Proceedings of that Society, Vol. I., p. 47 (Edition of 1873, p. 46) as follows:—"Dr. Behr presented a drawing of a native silk-worm of California with a specimen of the cocoon and the following description: *Saturnia* rubra, collare album, etc. . . . . It is found on the Ceanothus thrysiflorus . . . ." Owing to an oversight of the author or of the printer, no actual name for the species was proposed, the adjective "rubra" being merely part of the Latin diagnosis (as can be readily seen by the difference in type) and by no means to be employed as the name of the species. Dr. Behr several times expressed himself to this effect in letters to contemporary entomologists.

*Contribution from the Entomological Branch, Dept. of Agr., Ottawa.

On pages 68-69 (72 of Edition II.) of the same Proceedings, we find this note under date of Aug. 27th, 1855:—"*Donations to the Cabinet.* From Dr. Behr a specimen of the Cal. silk-worm (*Saturnia ceanothi* Behr)." There is no doubt as to the application of the name nor, I think, to its validity; the name *ceanothi* Behr cannot, however, under the most favorable conditions, be considered to have been published prior to the first week of September, 1855.

Meanwhile, in the Bulletin Soc. Ent. France for 1855, p. XXXII., we find recorded that Dr. Boisduval exhibited certain Californian Lepidoptera which he proposed describing at a later date; the name of each species, together with a very short diagnosis, was given, sufficient, however, I believe, to establish the validity of the names. Among the species mentioned was *Saturnia euryalus,* which is obviously the same species to which Behr applied the name *ceanothi,* in fact in Lep. de la Californie, p. 83, 1869, Boisduval mentions this fact, giving erroneously priority to *ceanothi* Behr.

Page XXXII. of the Bulletin Soc. Ent. France was issued with the first part of the Annales for that year and deals with the meetings held from January to March. Dr. N. Banks, who has kindly examined some of the current publications with a view to ascertaining the date on which Part I. of the Annales was published writes me that unfortunately no record of its reception is to be found either in the Transactions Ent. Soc. London or the Stettiner Entom. Zeitschrift. However, in the Proceedings of the meeting of the London Entomological Society, held Sept. 3rd, 1855, the receipt of a reprint entitled "Lettre addressée a M. Jacquelin du Val, etc.," is recorded; this reprint is from p. XXVI. of the same Bulletin and was read at the same meeting at which Boisduval presented his specimens. It must have been received by the Society between Aug. 6th and Sept. 3rd. It seems reasonable therefore to suppose that Part I. of the Annales for 1855 must, at the very latest, have appeared some time in August; as a matter of fact it probably was issued several months earlier.

Euryalus Bdv. will therefore clearly take priority over *ceanothi* Behr as the name for the Californian Silk-worm Moth, the name *rubra,* as used by later entomologists, having no valid standing.

CRANE-FLIES OF NEW YORK.

Cornell University has just issued Part II. of "The Crane-Flies of New York" by Charles Paul Alexander. This part, which is published as Memoir 38 of the University Agricultural Experiment Station, deals with the biology and phylogeny of the crane-flies and gives representative crane-fly life histories, external and internal morphology, and concludes with keys and descriptions. The monograph contains about 450 pages.

To persons interested in research in the field covered by the Memoir, copies will be sent as long as the supply lasts. Ask for M-38, and address requests to Office of Publication, College of Agriculture, Ithaca, New York.

Dr. C. L. Metcalf, for the past seven years Professor of Entomology in Ohio State University, has resigned to accept the position of Professor of Entomology and Head of the Department of Entomology in the University of Illinois. He should be addressed in care of the university at Urbana, Illinois, after September first.

Mailed, Oct. 31st, 1921.

The Canadian Entomologist

VOL. LIII. GUELPH, SEPTEMBER, 1921. No. 9

POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE HISTORY OF A HOBBY HORSE.

BY FRANCIS J. A. MORRIS,
Peterborough, Ont.

PART III.—SECOND CHILDHOOD—THE TREE'S INCLINE.

I suppose one reason why people do not transplant well in middle life is that they never cease to miss the common sights and sounds of their native land ; snatched away from daily contact with the environment in which they have grown and spread until they come to fill every nook and cranny of it, they suddenly find themselves wrenched from a thousand rootlets that ministered unseen to their life needs ; starved of their sap from root to stem, they lose their lusty vigour, languish along their branches, and pine away in leaf and flower and fruit. It is impossible to feel at home anywhere until you have become thoroughly familiar with your surroundings ; this power of adaptation, shared by us with all things living, is strictly limited, and if the change is too violent or the organism too far set in maturity, acclimatization becomes impossible.

Not the faintest idea had I when I came to Canada at twenty-five years of age that my comfort and happiness depended mainly on familiarity with a whole little world of natural objects, to which I had grown so used as to be quite unconscious of their presence. The web that at infinite pains and with prolonged effort I had woven for myself, at whose centre I swung cradled in content was suddenly swept away by the rough hand of circumstance ; I was flung bodily to an infinite distance, to find myself sprawling hopelessly on the ground ; instinctively I set all my spinnerets franctically to work rebuilding the orb without which life itself was impossible, and groping feverishly for fresh points of attachment.

All the years I had lived in Great Britain, I had never approached Nature by way of Science ; though roughly familiar with the broader distinctions of *family*, I knew next to nothing of *genus* and *species*, and had never studied the classification of either Flowers, Insects, or Birds ; my knowledge was purely empirical, and for the most part I was quite unconscious of the points of distinction in form and structure that must surely underlie our recognition of individual forms. I was therefore powerless to identify what I saw, unless by good luck it happened to have a next of kin among my acquaintance in Great Britain ; with every stranger I met along the roadside, I must turn (so like your stiff Englishman!) to my companions for an introduction, and then hunt him up in Burke's Peerage or some other book of celebrities ; and I found to my sorrow on enquiry that such popular guides and illustrations of the Ontario *flora* and *fauna* were unprocurable. In little old England, which you could set afloat in Lake Superior, for a century or better, authorities more numerous almost than the entire population of Canada had been publishing descriptions as accurate as those of Scotland Yard, portraits as lifelike as Madame Tussaud's, that must infallibly lead to the apprehension of every flower, fern, insect and bird in the

British Isles, no matter how securely hidden it might fancy itself from the long arm of the Naturalist.

I was as helpless as a child, and as full of curiosity, for I had just entered a new world full of novelties ; hundreds of flowers and insects that I had never seen before, flaunted their beauty in front of me at every turn ; scores of birds with strange plumage and unfamiliar cries met my gaze on every walk in the country ; and like a child, too, I wanted at first to know just their names, to have a simple label that I could attach to them, some definite word that I could hunt up in a book, and so round out my field observations.

It is not given to all to enter second childhood thus wide-eyed and mentally alert, and for the sake of others who may be similarly placed or may want in adult life to enter on the study of Natural History, I wish here to record some of my early experiences as a stranger in a strange environment to which the senses of his neighbours had grown dulled from boyhood. And let me tell you, I found it far harder to learn the secret of the sights and sounds that met me than if I had been a child. The world of childhood and boyhood was forever shut to me, and often I found myself envying the youngsters who were penetrating such mysteries day by day, without conscious effort, by companionship with their fellows and the traditions of their kind. I was herded with the grown-ups and found most of them sadly ignorant and careless of the Natural life about them.

It was when summer was already sinking into the lap of autumn, and within a fortnight of my setting foot in Canada, that I took up my quarters in Toronto preparatory to a 3-term session at the School of Pedagogy. Almost the first things that had struck me were the wonderful clarity of the air, and the lavish way of the sun in spilling whole weeks of blue unclouded summer days over the land. As we steamed up the St. Lawrence, I had noted with astonishment the sharp outlines and bright colours of the houses along the distant shore, so different from the hazy indistinctness of an English landscape. On landing at the docks I had been taken through Montreal on a sight-seeing tour ; I can't remember now what "Notre Dame" looked like either inside or out, but I know that the streets and sidewalks of the city were literally covered with grasshoppers, almost in the heart of the business section. About Toronto when you walked in the fields, every step you took squirted showers of these insects, as well as crickets and locusts, up at your face. It was as hard to steer a conversation safely through such elements as for a swimmer to breathe in a choppy sea,—you never knew when you were going to get a mouthful ; and often it was impossible to be quite sure whether your last ejaculation had been a word or an insect. After a little experience one learned to wade along in silence, glasses jammed close up to one's eyes and mouth tight shut, like a ship running through heavy seas with port holes closed and hatches battened down. Ontario had been in the grip of a drought for five or six weeks, a very exceptional thing, I was told ; but most of the twenty-five years passed in Ontario since 1894 have only gone to prove the rule of this exception.

My walks that Fall were mostly in the direction of Rosedale, and all of them alive with wonders; chipmunks and groundhogs, severally after their kind, came chattering and frisking forward with eager curiosity to meet the tender-

foot, went scurrying in shortlegged rippling bulk across the fields or stood stock still and bolt upright, "frozen" at the mouth of their burrow, the living counterpart of a neighbouring stump; acres of goldenrod and asters rioted beside the path ; goldenrod of the most beautiful curving plumes in place of the stiff homely spikes of the British species; asters of every size and shade, from white and pale lilac to the rich violet and blue of the Michaelmas Daisy; butterflies that fairly made one's mouth water, Swallow Tails and Fritillaries (Silver Spots), Camberwell Beauties (Mourning Cloaks), Tortoiseshells and Painted Ladies, fluttered and sailed and flew, a bevy of beauty; and mingling with them strangers of unmistakably royal blood (to judge from their robes), Emperors and Viceroys worthy of a front page in Burke's Peerage; and then the birds! In place of a single Green Woodpecker—rare and local—I saw four or five kinds, all painted as gay as the Tropics, the Flicker, the Red Head, the Downy, the Hairy, and these, mind you, for all their gorgeous plumage, as common as sparrows, or poppies in a cornfield. To cap it all, my ears were filled from every side in the woods with myriads of strange sounds, tapping, creaking, chirping voices, call-notes and songs, as mysterious as Echo, and all clamoring for me to join their game of "I spy" and track them to their secret lair; the very heavens were full of sound, showers of soft twittering notes and sweet music fell about me in the open; Puck in the woods and Ariel in the sky, what a royal hide-and-seek they had with me that Fall!

As we were were returning from Rosedale on one of these early trips, I called my companion's attention to the barking of a foxterrier in the distance; after locating the sound, he stared at me incredulously for a moment and then remarked scathingly : "A nice one you are in the country, and not know a crow when you hear it! " And a crow it proved to be, but how different, with its short, sharp, staccato challenge, of "cá, cá," from the English rook and its lazy drawl of "cäa, cäa!"

Two other birds I met that Fall for the first time in my life, the lovely Bluebird (a close kinsman of the English Redbreast) and the American Robin. This last I had looked eagerly forward to seeing for over a year; ever since the day when I had joined in the laugh that went round my uncle's dinner-table one Christmas at the expense of a cousin newly home from British Columbia. He had been regaling us with travellers' tales of the strange land beyond the seas, and we had all been devouring them with relish and perhaps a pinch of salt; till he came to this outrageous whopper, no more to be swallowed than Gulliver's reported linnets from Brobdingnag as big as swans: "In Canada," remarked my cousin with some pride, "our robins are as large as blackbirds." "Yes," countered my uncle drily, "and how large are your turkeys, my boy?" It was only when I became a resident of Ontario that I discovered the robins were a red-breasted thrush ; and in the Spring it soon grew to be an exquisite pleasure to note the bird's song, so characteristic of the thrushes, with its tell-tale bars "sung twice over," as Aristophanes observed more than twenty-three centuries ago and Robert Browning somewhat later ;—and if you had no ears to hear, behold ! the dumpy fledglings, with the speckled breasts they bore, and the way they had with the garden worms, the quick little run over the lawn and the head cocked on one side to listen, thrushes every inch

of them, from the tip of the bill to the toes.

During the winter I had made the acquaintance of Dr. Brodie and he had promised to take me out with him in the Spring ; unfortunately I was too busy between April and June to steal much time for Natural History. I was able, however, to make three or four trips in the doctor's company and learn something about the environs of Toronto. About the time of the Spring flights of warblers, we had a day at Victoria Park ; and later he took me over the Don flats to a wooded hill-side beyond the C.P.R. The trip I recall most vividly was my first visit to High Park. It was in June and our way led past the Grenadier Pond, and then west and north. I was greatly struck with the beauty of the scenery, the rolling downs, with their deep ravines, the groves of oak and pine, the underbrush and the richness of the vegetation, interspersed with barren tracts of drifting sand. High Park became a favorite resort of mine and I came in later days to wander all over the district from Parkdale to Humberside and Lambton.

We had taken insect nets with us, and in a heathy space dotted here and there with oaks I captured several butterflies; they were nearly all quite strange, and it was then, I think, that there first came home to me the hopelessness of identifying species without good illustrated popular books of entomology ; it was all plain sailing as long as the doctor was with me, but I fully realised how helpless I should be alone. On our way back in the late afternoon, we heard a bird singing in a near-by oak, and stopped to listen. I had rarely heard more delicious music, though obviously of less range and richness than a nightingale's ; it was certainly finer than the English thrush, I thought, and wilder like the Missel thrush's, the bars often repeated in true throstle fashion, and with many interludes of those wonderful soft undertones when you knew the bird's throat feathers would be gently ruffling above the breast ; the doctor thought it was a Hermit thrush ; it was certainly of the thrush family, for I caught a glimpse of it, large, brown, and with speckled breast ; I have since identified the bird from my recollection of the song, as the Brown Thrasher, and its choice of perch confirms this, almost at the top of a large oak, proclaiming itself to the world.

Without either musical ear or knowledge of musical terms, I wish to put it on record that except from the English nightingale I have rarely heard more delightful music than this bird's. It is quite a mistake to suppose that because poets have sung more wonderfully about the English skylark, the thrush and the nightingale, these bird-songs themselves must be far grander than those of Ontario ; the Brown Thrasher and the Rose-breasted Grosbeak are a match any day for their British cousins, and the Hermit Thrush is declared by such masters as John Burroughs and Schuyler Matthews to be more than the peer of the Nightingale ; it isn't the Bird that is wanting, it is the Wordsworth, the Shelley and the Keats ; given the human soul whose chords respond to the birds' ineffable sweetness, their tender melancholy, their world-old pathos and ecstasy of passion, and they too will be among the immortals.

Another fallacy the faithful observer must expose, in spite of poets' protest, is what Ruskin calls "the pathetic fallacy,"—to which we are all peculiarly prone in listening to the songs of birds ; we know, if we reason it out, that

there can be none of the rich content of human thought and the depth of human emotion behind those warblings ; yet as we listen the heart aches with infinite yearning, we are under the spell of enchantment and it sways our whole being. It is recorded somewhere how Shelley was rudely awakened from a dream of love once by the sight of his *inamorata's* healthy zest over a mutton chop ; he would have had the same revulsion of feeling in a Cambridge lane with me while listening to the Nightingale on a sunny day of June ; in the very midst of one of its divinest passages, its throat feathers stirring to the liquid melody, the bird stopped short and darted down to gobble a big grub, like the greediest fowl on wings—a *prima donna* and a glutton !

Soon after this trip to High Park, I went to spend the summer on Centre Island with some city friends, and at the close of the year was appointed to the staff of the Smith's Falls High School, on the Rideau River, some fifty miles south of Ottawa.

This was my first year in a country district and I hugely enjoyed meeting the natural conditions of an Ontario winter. Many a time as children in Scotland we had battled our way to school through blizzards of snow, had eagerly consulted the glass to see if "the black frost" was going to make the ponds bear, and one winter had twice seen with bulging eyes the mercury fall below zero. Sledges and skates had long vanished away, but again and again I found the experiences of this first real winter in Canada send my thoughts harking back over fifteen years and more to the Perthshire home.

It may have been this that made me more than usually homesick on the approach of Spring. I hungered for the sight of English hedgerows with sweet violets, primroses, hyacinths and half a hundred other familiar sights. I had forgotten for the moment all the novelties that had come in their stead, and this nostalgia lasted on all through the dreary days of March and early April, when nothing seems to be alive, and all the highways and byways stick up their effective "No Trespass" sign, daubed in inches of mud and slush. Another torture of Tantalus that aggravated my hunger later on was to be sent on some wild goose chase of eager anticipation, as when I was told of a bed of cowslips and found marsh marigolds, honeysuckle that proved to be columbine, Yellow-hammers that were Flickers ; I had even a childish disappointment over the "Daddy-long-legs" when it turned out a spider instead of a crane-fly.

Our school had only three assistants, and it was practically Hobson's choice for companionship ; the only man on the staff besides myself was the teacher of Science, and we had already fallen into the daily habit of walks together long before the winter ended.

The course of work for Science then in the Junior School was almost entirely Botany, and I watched with considerable interest his preparations for identifying flowers, an art till then wholly unintelligible to me. Half in a spirit of fun I rigged myself out with a little linen-tester for a magnifying glass, a pair of small needles sunk over head and ears (if they had them) in the pith core of a lilac twig, and a copy of Spotton's High School Botany; in three days I had outstripped even the most eager of his pupils ; in a week the jest was deadly earnest, and in a month the zealot became a hopeless monomaniac. I still hated to pick the flowers to pieces, and the tedium of working out some of the

less attractive genera and families, like the Crucifers and the Composites, came near to damping my ardour. Still I persevered, even resisting as a rule the terrible temptation to guess at the plant's identity *a priori*, instead of working it out honestly by the key. I think my progress surprised even my foster parent the Science master, for I took to Botany as a duck takes to the water ; he hadn't allowed enough for some of the main factors in the problem ; I had spent years in the English lanes and knew the household names of most of the familiar flowers ; Greek and Latin had become almost a mother tongue to me and a second nature, so that the botanical terms were full of meaning ; and, more than all, I burned with desire to gain "the freedom of the realm" ; ahead of me I could see summers full of glorious discovery in Ontario ; and when I had discovered America (botanically), I was determined to go over and discover Great Britain ; and never did Highlander with the gift of second sight see the vision of his own future more truly than I did that first Spring in Smith's Falls. It was a case of Archimedes and his lever over again ; given Spotton (or Gray), I could move the universe—or at least stick labels all over it ; if an Afrite had dropped me into the heart of some equatorial forest, I'd have welcomed the chance and, bar cannibals, crocodiles and the tsetse fly, been as happy as a clam.

That plants like animals had sex was a piece of common knowledge, but the analysis of a flower and the names and relations of its different parts were quite new to me. My first lessons were in this, and by taking a few leading types and separating their parts, identifying each of these and studying their mutual relations, I soon got the hang of the system.

The very heart and centre of every perfect flower was an elongate hollow body (the pistil) of complex nature, comprising below a vessel (the ovary) in which the unripe seeds (ovules) developed ; at the upper end of the ovary was a vertical extension in the form of a slender tube or hollow stalk (style) whose widened apex (stigma) served as a receptacle for the pollen-grains, which then passed down the style-tube into the ovary ; round this procreant cradle of the flower were grouped, like a body guard round their queen, a set of tiny stalks (stamens), each surmounted by a pair of little boat-shaped vessels (anthers) of pollen to quicken the ovules ; in turn about these two essential parts,—the queen and her consorts (pistil and stamens), were grouped usually two sets of leaf-like protective lobes known as the floral envelope ; the inner ring (corolla) of brightly colored lobes (the petals), and the outer ring (calyx) of green lobes (the sepals) ; if only one of these two rings occurred, whether green or brightly colored, it was called the calyx of sepals.

According to the form of the pistil and the number and arrangement of stamens, petals and sepals, all flowering plants were arranged into two great divisions : I. those whose seeds in germinating sprouted into a single leaf (Monocotyledons), and II. those whose seeds sprouted into a pair of leaves (Dicotyledons.) The first class had nearly always straight or parallel veins in the leaves, and their flower parts in 3's ; it included (a) Arrowheads, (b) Grasses, (c) Sedges, (d) Arums, (e) Rushes, (f) Lilies, (g) Irids, (h) Orchids. The second class had net-veined leaves and the parts of the flowers in 5's and 4's, occasionally 2's. Of this class a small sub-division bore the seeds naked (i.e.

not enclosed in a capsule), like the pines ; but the vast bulk of them possessed ovaries or seed cases. These were arranged in three divisions (1) those with one or both of the outer rings (corolla and calyx) wanting (Apetalous) ; (2) those whose petals were not united to one another (Polypetalous) ; (3) those whose petals were united, whether altogether or only at the base (Gamopetalous).

In the first few weeks of Spring it was easy to keep pace with the procession of flowers and assimilate the principles of the new science at the same time ; but in June and July the different kinds of habitat became so numerous and so crowded that one could not visit them all often enough to exhaust their denizens. However, in the course of two years, I knew nearly all in the neighbourhood, and it was only by going to a distance that I could add to my acquaintance ; but by a happy provision of Nature, when novelties ran out, the pleasure of renewing old acquaintance out-beggared the joys of fresh discovery.

(To be continued.)

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID GENUS ERNESTIA R. D. (DIPTERA).

BY JOHN D. TOTHILL.

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While in Washington, D.C., in March, 1921, Dr. Aldrich suggested that a revision of the nearctic species of the genus *Ernestia* would be a profitable undertaking. The rich collection in the U. S. National Museum was placed at my disposal, and I had with me some material belonging to the Entomological Branch of the Dominion Department of Agriculture and some California material belonging to Mr. E. P. VanDuzee. It was soon found that the male genitalia afforded an excellent series of characters for separating out the species, and the revision was consequently based largely upon a study of males. When the males had been sorted out into sixteen species, it was found that the females could be sorted out into fourteen species. It was not possible in all cases to assign a male and female to each species, and as the male characters are more readily seen than the female ones, it seemed better to base the descriptions of new species upon males. Descriptions of twelve new species have been drawn up and also of such of the existing species that seemed to require a more ample description than has been published. Well known and easily recognizable species have not been redescribed.

It is a great pleasure to acknowledge the cordial assistance given me by Dr. J. M. Aldrich, and also to express my sense of appreciation to Mr. Arthur Gibson, the Dominion Entomologist; Dr. L. O. Howard, the Chief of the U. S. Bureau of Entomology; and to Mr. A. F. Burgess of the U. S. Bureau of Entomology, for making the study in Washington possible. Mr. Charles T. Greene has been kind enough to make the drawings for this paper.

The genus Ernestia R.D.

Erigone R.D. Myod. 65, 1830.
Mericia R.D. Myod. 64, 1830.
Platychira Rond. Dipt. Ital. Prod. 1859.
Varichaeta Speiser, Berl. ent. Zeit. 1903.
Panzeria R.D. Myod., 69, 1830.

Okanagania Tn. Can. Ent. 289, 1915.
Melinocera Tn. Proc. Biol. Soc. Wash. XXVIII., 22, 1915.

The genus *Ernestia* was proposed in 1830 by Robineau Desvoidy for the reception of a single species that he called *microcera*. According to Bezzi (Kat. Pal. Dipt. 1907) the species *microcera* R.D. is a synonym of *rudis* Fall. described in 1810 as a Tachina. As the species *rudis* Fall. does not properly belong in the genus *Tachina*, it therefore becomes the type species of the genus *Ernestia*.

The genus *Fausta* was proposed in 1830 by Robineau Desvoidy for the reception of five species. In 1863 the same author designated *nemorum* Meig. as the type species of the genus. For reasons that will appear later, it seems that in spite of the wide parafacials, this species is closely related to the generalized *Ernestias*, such as *rudis* Fall. and *radicum* Fab. In order to preserve the sense of relationship with *Ernestia* and yet to bring out the difference between the two series, it seems advisable to treat *Fausta* as a subgenus of the genus *Ernestia*.

The species described by Coquillett as *Meriania chalybea* is undoubtedly congeneric with *puparum* Fab. of Europe, a male and female of which—determined by Bezzi—I have seen. The genus was proposed for species having the sides of the face hairy and otherwise resembling *Ernestia* s. str. Hairiness of the facialia in this group is, however, of questionable generic value because *Ernestia flavicornis* Br. exhibits a marked tendency in this direction, especially in some specimens. Furthermore, the male genitalia in *chalybea* Coq. and in *puparum* Fab. also exhibit the same generalized features as do those of *E. flavicornis*. The best way to express this clear relationship seems to be to treat *Meriania* as a subgenus of the genus *Ernestia* for the inclusion of *puparum* Fab., *chalybea* Coq., *flavicornis* Br., and *nigrocornea* sp. n.

These two subgenera, *Fausta* and *Meriania*, are evidently closely related, as shown by the generalized genitalia. In the known species they can be separated by the presence of discal bristles on the second abdominal segment in *Fausta* and by their absence in *Meriania;* and by the presence of hairs on the parafacials in *Meriania* and by their absence in *Fausta*. An undetermined female *Ernestia* from Armstrong, B.C., in the National Collection at Ottawa has both hairy parafacials and discal abdominal bristles; if, when the male becomes known, this proves to belong to the *Fausta-Meriania* group, it would show that these two subgenera could be treated more naturally as a single subgenus.

The genus *Metaphyto* was proposed by Coquillett in 1897 for the reception of a single species, *genalis* Coq. This species has wide parafacials as in *Fausta* and genitalia that relate it to *Ernestia arcuata* et al. (See the discussion of this point later). The relationships will be fairly well expressed by treating *Metaphyto* as a subgenus of the genus *Ernestia*.

An examination of the type of *Okanagania hirta* Tn. shows the fly to be *E.* (*Metaphyto*) *genalis* Coq.

Xanthophyto labis Tn. may prove to be an *Ernestia* when more is known about its habits. The yellow third segment of the antenna, the cloud over the radio medial cross vein, and the generalized condition of the male genitalia all

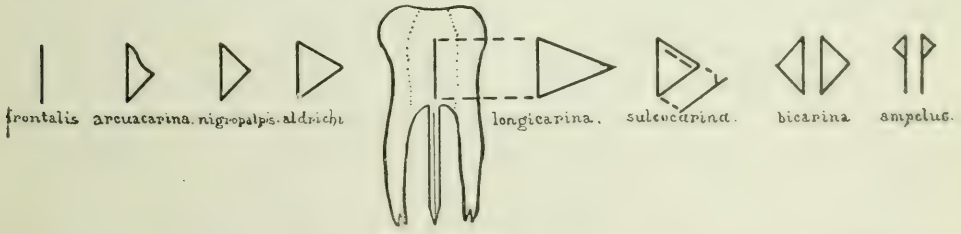
suggest a close affinity with *E. flavicornis* Br. Until the male is known, however, and until the reproduction habit is established, there is not sufficient justification for linking the genus with that of *Ernestia*. In *X. labis* the chaetotaxy of the scutellum differs from that of all the known species of *Ernestia*.

Pyraustomyia penitalis Coq. exhibits the same peculiar scutellum chaetotaxy found in *X. labis*, and is probably not congeneric with *Ernestia*.

In so far as is known, all the members of the genus *Ernestia* have the habit of depositing living maggots in the path of their host.

Interrelations of the Nearctic Species

The nearctic species of the genus *Ernestia* differ from one another chiefly in the structure of the male genitalia—most of the species are in fact inseparable without reference to these organs. Arranging them in a series according to the degree of specialization of the genitalia, one can therefore gain some idea as to their immediate ancestry. The most generalized condition of the genitalia is found in *E. flavicornis* Br., *E. nigrocornea* sp. n., *E. chalybea* Coq., and *E. frontalis* sp. n., where the base of the inner forceps has developed no median keel-like projection. In *arcuata* sp. n., *johnsoni* sp. n., *nigropalpis* sp. n., and *incisa* sp. n. there is a well-developed keel-like projection. More highly specialized again are *E. aldrichi* Tn. and *E. longicarina* sp. n. in which the keel-like projection has become longer than in any other known nearctic species. In *E. platycarina* sp. n. one margin of the carina has become flattened. In *sulcocarina* sp. n. the same margin has become grooved. In *bicarina* sp. n. the groove in the carina has developed to such an extent that a splitting has occured so that there are two keel-like projections instead of one. Finally, in *E. ampelus* Walk., and in *E. fissicarina* sp. n., the two keel-like projections have become reduced into a pair of knob-like structures. From these facts the group would appear to be monophyletic. With the evolution of the keel-like projection in mind, it is possible to test the validity of the genus *Fausta* proposed for the reception of forms having the sides of the face abnormally wide. In the type species *E. nemorum* Meig., the keel-like structure is in the generalized condition found in *E. flavicornis* Br., *E. frontalis* sp. n., *E. nigrocornea* sp. n., *E. rudis* Fall. and *E. radicum* Fab. In the nearctic species *genalis* Coq., on the other hand, there is a well-developed unsplit median keel-like projection as in *E. arcuata*. It would seem, therefore, that *Fausta* is not a natural genus, as the species are less closely related to one another than to species in the genus *Ernestia*. An explanation that suggests itself is that in the evolution of the *Ernestia* group a widening of the sides of the face has taken place twice; first when the genitalia were still generalized, and secondly when a keel-like process had been developed. Such a relationship can be expressed by retaining



Fausta as a subgenus for the inclusion of the generalized *nemorum* Meig. and by retaining *Metaphyto* Coq. as a subgenus for the inclusion of *genalis* Coq.

Relationships of the Nearctic and Palaearctic Species of the Genus Ernestia s. str.

From an examination of five palaearctic species it would appear that while some of the nearctic species are very closely related to palaearctic species, yet there are perhaps no two species common to the two land masses. A more extensive study of the European material may, of course, serve to modify this statement. It may be of interest to point out the difference between the European species I have examined and their nearctic relatives.

A male specimen of *E. rudis* Fall., so determined by Bezzi, has no keel-like projection on the basal part of the inner forceps, and in this respect resembles *E. flavicornis* of Brauer and my *E. frontalis*. It differs from the former in not having a bright yellow third antennal segment and from the latter in having the width of the front at the narrowest place equal to less than the length of the second antennal segment.

A male specimen of *E. radicum*, so named by Brunetti, has a keel-like projection on the basal part of the inner forceps in such a rudimentary condition that it can only be seen by careful scrutiny. It differs from *E. flavicornis* Br. in the color of the third antennal segment; from *E. frontalis* in the notably shorter inner forceps of the male genitalia and from *E. nigrocornea* in the narrower facialia.

A male specimen of *E. connivens* Zett., so named by Bezzi, is evidently very closely related to my *nigropalpis* and *arcuata* In *nigropalpis*, however, the tips of the outer forceps are laterally compressed so as to be bayonet-like in shape; and in *arcuata* the fifth tergum is much longer and more clearly defined.

A male specimen, named *E. consobrina* Meig. by Bezzi, has a median keel-like projection on the base of the inner forceps that is split longitudinally into two halves, very much as in the case of my *bicarina*. In the latter species, however, the splitting process has been carried considerably further; and also each prong of the fifth sternite terminates in a short spine, which is not the case in *consobrina*.

There is a male specimen from Shirmer, labelled "Berlin, Germany," that has not been identified. It runs in my key to section 10 but it can be readily separated from all the nearctic species on account of the extraordinary length of the median keel-like projection on the base of the inner forceps.

Distribution of the Genus Ernestia.

Our knowledge of the distribution of the genus *Ernestia* in the Southern Hemisphere is too meagre to warrant any conclusion concerning the origin and development of the group for the whole world. For the Northern Hemisphere, however, our knowledge of the distribution of the group is at least fairly complete. In his catalog of palaearctic Diptera, Kertesz lists twenty-three species, while for North America we now have sixteen species; consequently, palaearctic rather than a nearctic origin is indicated, although, of course, by no means proven.

Further light is thrown upon this question by reference to the degree of specialization of the species in the respective regions. We have already

seen that the condition of a split keel-like process on the base of the inner forceps represents almost the highest achievement in the specialization of these flies. This condition is reached by *E. consobrina* Meig. in Europe and by *E. bicarina* sp. n. in America. It therefore seems certain that the split keel was achieved when a land bridge connected the two great land masses. It also follows that the group achieved its greatest development during the period of the last land bridge. Indeed, the only development of any importance that appears to have taken place since the land bridge days is the reduction of the split keel found in the two American species, *ampelus* Walk., and *fissicarina* sp. n.; and further studies of the palaearctic species may show even this slight specialization to have been an ancient rather than a modern achievement.

As there are reasons for supposing that very few, and perhaps none, of the now extant species are common to the two land masses, it seems to follow that although the nearctic and the palaearctic species have had a common origin during the land bridge period, yet a slight further development has been achieved in each of the now separated land masses during the recent period of isolation.

Synopsis of the Nearctic Species in the Genus Ernestia R. D.

Subgenus *Meriania*.

chalybea Coq.
flavicornis Br.
nigrocornea sp. n.

Subgenus *Fausta*.

No nearctic species known.

Snbgenus *Ernestia*.

frontalis sp. n.
johnsoni sp. n.
nigropalpis sp. n.
arcuata sp. n.
incisa sp. n.
aldrichi Town.
longicarina sp. n.
platycarina sp. n.
sulcocarina sp. n.
bicarina sp. n.
ampelus Walk.
fissicarina sp. n.

Subgenus *Metaphyto*.

genalis Coq.

Key to the Subgenera of the Genus Ernestia.

1. No discal macrochaetae on the second abdominal segment; parafacials hairy, at least in the females, especially on the upper part..... .... Subg. *Meriania*

   Discal macrochaetae present on the second abdominal segment; third antennal segment black; parafacials never hairy, even on the upper part 2

2. Width of the parafacials not nearly equal to the length of the third anten-

nal segment..... ....*Ernestia* s. str.
Width of the parafacials equal to the length of the third antennal segment, i.e., parafacials unusually wide.....3
3. A median keel-like projection at the base of the inner forceps of the male genitalia, i.e.; genitalia specialized.....Subg. *Metaphyto*
No such projection, i.e., genitalia generalized.....Subg. *Fausta*

KEY TO THE NEARCTIC SPECIES IN THE SUBGENUS MERIANIA.

1. Third antennal segment black.....*E. nigrocornea* sp. n.
Third antennal segment yellow or reddish.....2
2. Width of front in male equal to less than the length of the second antennal segment; parafacials very hairy in the male.....*E. chalybea* Coq.
Width of front in male equal to the length of the second antennal segment; parafacials in the male hairy on only the upper part and the hairs very thin..... .....*E. (Meriania) flavicornis* Br.

KEY TO THE MALES OF THE NEARCTIC SPECIES OF THE GENUS ERNESTIA S. STR.

1. Genitalia yellow or rufous..... 2
Genitalia dark or black..... 3
2. Width of the front at narrowest place less than the length of the second antennal segment; inner forceps with a short keel flattened on one edge..... ....*platycarina* sp. n.
Width of the front at narrowest point equal to or greater than the length of the second antennal segment; inner forceps without a keel and with two conspicuous projections placed side by side.....*ampelus* Walk.
3. Width of front at narrowest point fully twice as long as the second antennal segment..... 4
Width of front at narrowest point less than twice the length of the second antennal segment 6
4. Inner forceps with a conspicuous keel.....*aldrichi* Tn.
Inner forceps without a keel..... 5
5. Base of inner forceps with two conspicuous projections placed side by side..... ....*fissicarina* sp. n.
Base of inner forceps without such projections.....*frontalis* sp. n.
6. The fifth sternite with a deep incision on the lateral margin of each of the two prongs..... ....*incisa* sp. n.
The fifth sternite normal..... 7
7. The inner forceps with a pair of short keels placed side by side..... ....*bicarina* sp. n.
The inner forceps with a single keel.....8
8. The width of front as great or greater than the length of the second antennal segment..... ....*johnsoni* sp. n.
The width of front less than the length of the second antennal segment..... 9
9. Palpi black; the fifth tergum scarcely distinguishable from the first genital segment with which it is united.....*nigropalpis* sp. n.
Palpi reddish, at least at tip; the fifth tergum clearly marked off, at least laterally by a suture from the sixth.....10
10. Keel-like portion of the base of the inner forceps of unusual length, its dor-

sal edge not concave; the apical portions of the outer forceps laterally compressed and each terminating in a pair of hooks..*longicarina* sp. n.
Keel-like portion not of remarkable length, its dorsal edge strongly concave; the apical portions of the outer forceps cylindrical and each terminated by a single hook.....*arcuata* sp. n.

KEY TO THE FEMALES OF THE NEARCTIC SPECIES IN THE GENUS ERNESTIA.

1. Third antennal segment yellow.....Subg. *Meriania*
Third antennal segment black.....Subg. *Ernestia* 2
2. Fourth abdominal segment rufous.....3
Fourth abdominal segment black.....4
3. Second antennal segment rufous.....*ampelus* Walk.
Second antennal segment black.....*platycarina* sp. n.
4. Second antennal segment yellow.....5
Second antennal segment black.....8
5. Fifth sternite without a longitudinal groove or depression; tarsal segments of front legs cylindrical; bend of fourth vein with a well-marked appendage.....sp. *a*
Fifth sternite with a longitudinal groove or depression; tarsal segments of front pairs of legs flattened dorsoventrally; bend of fourth vein with a very indefinite or with no appendage.....6
6. Fifth sternite with a deep longitudinal depression.....7
Fifth sternite with a very shallow longitudinal depression.....sp. *c*.
7. The depression in the fifth sternite extending through the posterior margin, i.e.; the posterior margin concave; a short but distinct carina running the full length of the depression.....sp. *b*.
The depression in the fifth sternite not extending through the posterior margin, i.e.; the posterior margin straight; no carina in the depression.....sp. *d*.
8. Front at the vertex as wide as either eye; the second, third and fourth but not the fifth abdominal sternites each with a group of strong, blunt, downwardly directed macrochaetae seen best in profile.....9
9. Palpi coal black.....*nigropalpis* sp. n.
Palpi yellow, at least at tip.....10
10. The fifth abdominal sternite with two parallel longitudinal grooves separated by a shallow carina.....*bicarina* sp. n.
The fifth abdominal sternite with only a single longitudinal groove or depression.....11
11. The fifth sternite longer than the fourth.....*sulcocarina* sp. n.
The fifth sternite shorter than the fourth.....probably *johnsoni* sp. n.

(To be continued)

NEW SPECIES OF CRANE-FLIES FROM NORTH QUEENSLAND (TIPULIDAE, DIPTERA).

BY CHARLES P. ALEXANDER,
Urbana, Ill.

The undescribed species of crane-flies that are characterized herewith were kindly sent to me by Dr. James F. Illingworth. Most of the material was

collected along the Babinda Creek, North Queensland. The difficulties in the way of collecting these insects in Queensland are well shown by the following paragraph from one of Dr. Illingworth's letters:

"Sweeping along streams is almost out of the question here in the tropics, where every bush is provided with recurved hooks to hold one up. I have torn a number of nets full of holes trying to do it and seldom make a catch. Most of the specimens I found either singly on the vegetation, in the scrub, or in caverns under the large rocks along the streams."

A few additional specimens were secured by Mr. Alan P. Dodd. I would express my indebtedness to Dr. Illingworth and Mr. Dodd for this interesting material. The types of the new species will be preserved in the writer's collection.

Genus **Dicranomyia,** Stephens.
Subgenus **Thrypticomyia,** Skuse.

The type of the subgenus is *D.* (*T.*) *aureipennis* (Skuse) (Australia). Other species belonging to this group are *D. arcuata* (Alexander) (Japan), *longivena* (Edwards) (India), *seychellensis* (Edwards) (Seychelles Islands) and probably *saltens* (Doleschall) (Oriental Region). Two additional undescribed species were included in the present material.

Dicranomyia (Thrypticomyia) doddi, sp. n.

General coloration dark brown; thoracic pleura obscure brownish yellow; tarsi largely white; wings with a distinct brown suffusion that is uniformly distributed over the wing surface; stigma large; supernumerary crossvein in cell Sc_1 only a short distance before r.

Male.—Length 6 mm.; wing 5.8 mm.

Female.—Length 5.5 mm.; wing 6 mm.

Rostrum obscure yellow; palpi dark brown. Antennae dark brown. Head greyish brown.

Mesonotum dark brown. Pleura obscure brownish yellow. Halteres long and slender, dark brown. Legs with the coxae and trochanters dark brown; femora dark brown, slightly paler basally; tibiae and about the basal one-half or slightly more of the metatarsi dark brown; remainder of the tarsi white or faintly reddish white. Wings with a uniform brownish suffusion; stigma large, elongate-oval, dark brown; veins dark brown. Venation: Sc ending opposite the origin of Rs; Sc_2 pale, removed from the tip of Sc_1, the latter being about equal to the deflection of R_{1+2}; supernumerary crossvein in cell Sc a little more than the length of r before this latter crossvein; extreme tip of R_1 atrophied;; inner end of cell 1st M_2 slightly arcuated; cell 1st M_2 about equal to vein M_3 beyond it; basal deflection of Cu_1 near midlength of cell 1st M_2.

Abdomen dark brown.

Habitat.—North Queensland.

Holotype, ♂, Gordonvale, June, 1920 (A. P. Dodd).

Allotopotype, ♀.

Paratopotype, ♂.

This crane-fly is dedicated to its collector, Mr. Alan P. Dodd. Its closest relative is apparently *D. seychellensis* (Edwards) which differs mainly in the coloration of the wings.

Dicranomyia (Thrypticomyia) fumidapicalis, sp. n.

General coloration dark brown; thoracic pleura yellow; legs dark brown, the tarsi largely white; wings hyaline basally, with about the apical fifth strongly infuscated.

Male.—Length 6—6.5 mm.; wing 6.7 mm.

Female.—Length about 5.5 mm.

Described from alcoholic specimens.

Rostrum and base of palpus obscure brownish yellow; terminal palpal segments dark brown. Antennae dark brown, the flagellar segments with a short basal pedical and with long, unilaterally arranged verticils as in the males of this group. Head dark.

Mesonotum dark brown, the median area of the scutum and the postnotum paler. Pleura obscure yellow, the mesosternum infuscated. Halteres elongate, brown. Legs with the coxae and trochanters yellowish; only the fore legs remain attached to the body; femora, tibiae and about the basal third of metatarsi dark brown; remainder of the tarsi except the terminal segment white; fore metatarsi with a small tubercle near the base. Wings hyaline with about the apical fifth strongly infuscated, this including almost all the wing beyond the level of the cord; stigma oval, still darker brown; veins dark brown. Venation: Sc_1 before the origin of Rs, Ss ending just beyond the origin of Rs, Sc_1 alone being a little longer than the basal deflection of Cu_1; Rs long, arcuated at origin; r near tip of R_1; cell 1st M_2 long and narrow, longer than vein M_3 beyond it; basal deflection of Cu_1 beyond midlength of cell 1st M_2.

Abdomen of male long and slender, dark brown; sternites a little paler.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Allotopotype, ♀.

Paratopotypes, 2 ♂'s.

The apically darkened wings are very conspicuous.

Subgenus Idioglochina, subgen. n.

Flagellar segments with the inner face strongly produced into flattened disks, giving a subserrate appearance to the antennae, the periphery of each disk with a series of about six spinous bristles. Wings with costa and radius greatly incrassated; r long, arcuated; cell R_1 very large, due to the strong bending of R_{2+3} toward R_{4+5} near its origin.

Type of the subgenus.—*Rhipidia tusitala* Alexander (Samoa).

Dicranomyia de beauforti de Meijere (Papuan subregion) is also a member of this subgenus.

Subgenus Euglochina, subgen. n.

Wings very long and narrow, cuneiform, entirely without an anal angle; Rs very short, about equal to the basal deflection of R_{4+}, originating far out toward the wing-tip, the cord lying beyond five-sixths of the wing-length; cells beyond the cord unusually short and crowded; vein 2nd A running parallel to Cu, at the margin separate or fused with the tip of Cu_2.

Type of the subgenus.—*Dicranomyia cuneiformis* de Meijere. (India to Java).

Dicranomyia connectans Alexander (Tropical Africa) is also a

member of this subgenus. Edwards (Ann. Mag. Nat. Hist., ser. 8, vol. 8, pp. 58, 59; 1911) has determined the *Limnobia saltens* of Doleschall as falling in this group of species. Almost coincidentally, De Meijere (Tijdsch. v. Ent., vol. 54, p. 22; 1911) determined *saltens* as being a typical member of *Thrypticomyia* Skuse. The habitus of the species of *Euglochina* is very distinct from that of *Thrypticomyia*.

Genus **Libnotes,** Westwood.

Subgenus **Pseudoglochina,** subgen. n.

Tarsal claws simple, the basal enlargements provided with two acute bristles. Wings long and narrow, cuneiform, entirely without an anal angle; Rs short, straight; no supernumerary crossvein in cell Sc_1; cell 1st M_2 open by the atrophy of M_3.

Type of the subgenus.—*Libnotes pulchripes* Alexander.

Dicronomyia kobusi de Meijere and *D. bicinctipes* Brunetti of the Oriental region are likewise members of this group. In the opinion of the writer, the group is closer to *Libnotes* than to *Dicranomyia* but this whole series of genera and subgenera are very closely allied.

Genus **Geranomyia,** Haliday.

Geranomyia (Geranomyia) sagittifer, sp. n.

Rostrum and antennae black; vertex silvery grey; general coloration of the thorax shining orange, the mesonotal praescutum with a median arrow-shaped black mark; legs pale yellowish brown; wings pale grey with five rather small brown costal markings, vein Sc long.

Female.—Length (excluding rostrum) 6.5 mm.; wing 6 mm.; rostrum alone 2.9 mm.

Rostrum and palpi dark brownish black. Antennae black. Head above silvery grey.

Mesonotum shiny orange, the praescutum with a single arrow-shaped median black mark, the broad end behind, a short distance before the suture, the narrow end terminating slightly anterior to the level of the pseudosutural foveae. Thoracic pleura dull ochreous. Halteres orange, the knobs a little infuscated. Legs with the coxae and trochanters orange; femora brownish yellow; tibiae and tarsi light brown. Wings pale grey, the costal and subcostal cells a little more yellowish; five comparatively small brown markings in the costal region, arranged as follows: at the supernumerary crossvein in cell Sc; at origin of Rs; at tip of Sc_1; at tip of R_1 and r, and at the end of the vein R_{2+3}; cord and outer end of cell 1st M_2 very narrowly and indistinctly seamed with grey; veins brown. Venation: Sc long, Sc_1 extending to just beyond the end of Rs, Sc_2 at the tip of Sc_1; Rs long, angulated at origin, thence straight; cell 1st M_1 pentagonally rectangular, widened distally, about as long as vein M_{1+2} beyond it; basal deflection of Cu_1 just beyond the fork of M.

Abdomen dull orange-yellow.

Habitat.—North Queensland.

Holotype, ♀, Gordonvale, June, 1920 (A. P. Dodd).

Paratypes, 3 ♂'s, Babinda, October, 1920 (J. F. Illingsworth).

Geranomyia (Geranomyia) nigronitida, sp. n.

Head dark; mesonotum shiny black, the pleura yellowish; wings nearly

hyaline; stigma small, brown; Sc long, basal deflection of Cu_1 before midlength of cell 1st M_2; abdominal tergites dark brown, sternites light yellow.

Male.—Length (excluding rostrum) 6—6.4 mm.; wing 5.8—6 mm.; rostrum alone about 3 mm.

Female.—Length (excluding rostrum) 7.5 — 7.8 mm.; wing 6.5 mm.; rostrum alone about 3.5 mm.

Described from alcoholic specimens.

Rostrum elongate, dark brown; palpi dark brown. Antennae dark brownish black. Head dark, grayish pruinose.

Pronotum dark brown. Mesonotum shiny black, the humeral regions of the praescutum paler; in dried specimens the lateral margins of the praescutum may be slightly pruinose. Pleura obscure yellow. Halteres pale yellowish white. Legs with the coxae and trochanters yellow; remainder of the legs broken. Wings nearly hyaline; stigma small, brown; veins dark brown. Venation: a supernumerary crossvein in cell Sc; Sc long, Sc_1 extending to just before the end of Rs, Sc_2 a short distance from the tip of Sc_1, the latter about equal to m; Rs comparatively short, straight, about twice the deflection of R_{1+5}; inner end of cell 1st M_2 slightly arcuated; outer deflection of M_3 a little longer than m; basal deflection of Cu_1 before midlength of cell 1st M_2, much longer than Cu_2 alone.

Abdominal tergites dark brown, especially in the female; sternites light yellow.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Allotopotype, ♀.

Paratopotypes, 4 ♂ ♀.

Genus **Molophilus,** Curtis.

Molophilus unispinosus, sp. n.

General coloration sulphur-yellow; vertex with a brown spot; mesonotum light chestnut; male hypopygium with three pleural appendages on either side, the longest a cylindrical curved arm with the apex enlarged and provided with a powerful blackened spine, surrounded by numerous yellow hairs.

Male.—Length about 3.5 mm.; wing about 3.7 mm.

Described from an alcoholic specimen.

Rostrum and palpi brown. Antennal scape light sulphur-yellow, the flagellum broken. Head sulphur-yellow above with a conspicuous circular dark brown spot on the vertex; genae slightly infuscated.

Mesonotum with the praescutum light chestnut, the lateral margins dark brown; scutal lobes similar, the posterior lateral angles slightly produced laterad, light yellow; scutellum chestnut yellow; postnotum obscure yellow. Pleura brownish yellow, the dorso-pleural region light sulphur-yellow. Halteres pale, the knobs light sulphur-yellow. Legs with the coxae and trochanters pale brownish yellow; remainder of the legs broken. Wings greyish yellow, the veins yellowish.

Abdomen brownish yellow, the lateral margins of the tergites paler. Male hypopygium with three pleural appendages on either side, the longest a cylindrical curved arm that is expanded into a collar at the end, armed with a single

powerful chitinized spine, surrounded by numerous golden-yellow hairs.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Molophilus longioricornis, sp. n.

General coloration dark brown; antennae of the male elongated; pleural appendages of the male hypopygium a chitinized horn with a long, slender spine on the proximal face beyond midlength.

Male.—Length about 3.2 mm.; wing, about 3.6 mm.

Described from an alcoholic specimen.

Rostrum and palpi pale brown. Antennae dark brown ; the flagellar segments are broken beyond the base but the antennae are very long, probably only a little shorter than the body. Head dark.

Thorax dark brown, only the pleural membranes paler. Halteres pale, the knobs a little darker. Legs with the coxae pale brownish yellow ; trochanters yellow ; remainder of the legs broken. Wings with a strong grayish suffusion ; veins dark brown.

Abdomen dark brown. Male hypopygium with each pleural appendage appearing as a cylindrical chitinized horn, the bent apex suddenly narrowed into a chitinized spine that is directed proximad ; beyond midlength of the appendage on the proximal face is a long, slender, slightly bent spine; the outer face of the appendage is provided with several small appressed spines.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Genus **Limnophila,** Macquart.

Limnophila illingworthi, sp. n.

Antennae dark brown, the first flagellar segment light yellow; mesonotal praescutum and pleura brownish yellow, narrowly striped longitudinally with brown ; legs dark brown, femora with a narrow yellowish subterminal ring ; tibiae with a narrow yellowish ring just beyond the base; wing light gray, the costal margin strongly yellowish; a series of dark brown costal spots; all cells of the wing dotted with gray ; costal fringe conspicuous.

Male.—Length about 8 mm.; wing about 8.5 m.

Described from an alcoholic specimen.

Rostrum brown ; palpi dark brown. Antennae dark brown, the first flagellar segment conspicuously light yellow ; antennae short, the first scapal segment elongate. Head brown, paler between the eyes.

Mesonotal praescutum brownish yellow, indistinctly striped longitudinally with brown, there being a more conspicuous median stripe that becomes obliterated before the suture and two sub-lateral stripes on either side ; lateral margins of the praescutum darker brown; scutum obscure brownish yellow, each lobe encircled by brown, this circle darker anteriorly and laterally; scutellum pale brownish yellow with a narrow brown median line ; postnotum pale brownish yellow with the median line darker brown and with two transverse bars, one near midlength, the other at the posterior margin. Pleura yellow, striped longitudinally with pale brown, there being two or three more or less complete brown stripes that are a little narrower than the pale stripes between. Halteres yellow, the knobs slightly darker. Legs with the coxae yellow, traversed by narrow brown lines, there being two such lines on the fore and middle coxae;

trochanters yellow ; femora dark brown, with a narrow light yellow ring before the broad (2 mm.) tips ; tibiae dark brown with a narrow light ring immediately beyond the base, this a little broader than the pale femoral ring ; tarsi pale brown. Wings light gray, the costal margin strongly yellow; wings heavily spotted with dark brown and gray; a series of dark brown spots along the costa, there being about ten before the larger one at the tip of Sc; three additional large spots situated at the ends of veins R_1, R_2, and R_3 ; a large pale brown area at the origin of Rs and as seams along the cord and outer end of cell 1st M_2 ; all cells of the wings with rather abundant gray dots, a little larger and heavier at the ends of the longitudinal veins ; veins brown, costa, subcosta and radius more yellowish. Venation: Sc long, Sc_1 extending some distance beyond the fork of R_{2+3}, Sc_2 nearly three times as long as Sc_1 alone ; indistinct supernumerary crossveins in the last three brown spots in the costal cell; Rs long, almost square at origin ; R_{2+3} short, shorter than the basal deflection of Cu_1 ; r at the tip of R_1 and beyond midlength of R_2 ; inner ends of cells R_3, R_5 and 1st M_2 in oblique alignment; cell 1st M_2 long and narrow, the outer end widened ; petiole of cell M short, about equal to the basal deflection of Cu_1, the latter inserted just before midlength of cell 1st M_2 ; costal fringe conspicuous.

Abdominal tergites brown, darker brown laterally ; sternites a little paler, especially on the caudal half of the segment.

Habitat.—North Queensland.

Holotype, ♂, Babinda, August 7, 1920 (J. F. Illingworth).

Paratopotype, ♂, October, 1920, (J. F. Illingworth).

This handsome crane-fly is dedicated to its collector, my friend, Dr. James F. Illingworth. It is possible that it is more correctly referable to *Epiphragma* but the supernumerary crossveins in the costal cell are very faint and three in number.

ANNOTATED CHECK LIST OF THE MACROLEPIDOPTERA OF ALBERTA—ADDITIONS, 1920

BY KENNETH BOWMAN,
Edmonton, Alberta.

I record below the additions to my "Check List of the Macrolepidoptera of Alberta, published by the Alberta Natural History Society (Red Deer, 1919), which were made during the season of 1920.

The numbers before the names are those of Messrs. Barnes and McDunnough's "Check List of the Lepidoptera of Boreal America, 1917." The numbers after the names indicate the month in which the insects were taken. The capital letters are abbreviations of localities, as follows: B, Banff ; Bm, Blairmore ; C, Calgary ; Cd, Cadomin ; E, Edmonton ; L, Laggan ; N, Nordegg; P, Pocohontas.

The insects were identified by Messrs. Barnes & Lindsay, Mr. L. W. Swett and Dr. J. McDunnough, as shown by the initials in brackets following each insect. I wish to express my great indebtedness to them for their kindness in identifying these insects.

57 *Eurymus hecla pallida* Skin. & Men. . . . . 6 N. (B & L)
205 *Euphydryas colon* Edw. . . . . 6 Bm. (B & L)
957 *Isia isabella* A. & S. . . . . 6 C. (B & L)
987 *Apantesis blakei superba* Stretch. . . . . 7 C. (B & L)
1310 *Euxoa atropulveria* Sm. . . . . 9 Bm. (B & L)
1567 *Rhynchagrotis morrisonistigma* Grt. . . . . 7 N. (B & L)
2362 *Eremobia alticola* Sm. . . . . 8 Cd. (B & L)
3576 *Lomanaltes eductalis* Wlk. . . . . 7 E. (B & L)
3945 *Carsia paludata* Thun. . . . . 8 E. (B & L)
N.S. *Lobophora simsata* Swett . . . . . 6 E. Wabaska River (L.W.S.)
3977 *Lygris diversilineata* Hbn. . . . . 8 C. (B & L)
3978 *Lygris propulsata* Wlk. . . . . 7.8 E. C. Cd. (J.McD.)
N.S. *Hydriomena mcdunnoughi* Swett . . . . . 5 N. Cd. (L.W.S.)
N.S. *Xanthorhoe dodata* Swett. . . . . 6.8 L. P. (L.W.S.)
N.S. *Xanthorhoe reclivisata* Swett . . . . . 7 L. (L.W.S.)
N.S. *Xanthorhoe incursata lagganata* Swett . . . . . 7 L. N. (L.W.S.)
4156 *Eupithecia palpata* Pack. . . . . 6 E. (L.W.S.)
4374 *Phasiane hebetata* Hlst. (*demaculata* B&McD) 6.7 E.N.P.C.Bm. (L.W.S.)
4401 *Itame occiduaria* Pack. . . . . 7 C. (B & L)
4424 *Itame decorata* Hlst. . . . . 7.8 C. (B & L)
4644 *Sicya macularia agyllaria* Wlk. . . . . 8 N. Cd. B. (J.McD.)
4726 *Metanema quercivoraria* Gn. . . . . 7 N. (B & L)
4748 *Pero occidentalis* Hlst. . . . . 6 P N. (B & L)
5097 *Phlyctaenia indistinctalis* Warr. . . . . 7 N. (B & L)
5102 *Phlyctaenia tertialis* Gn. . . . . 7E. N. (B & L)
5253 *Pyralis farinalis* Linn. . . . . 8 E.
6751 *Paranthrene polistiformis* Harris. . . . . 8 C. (J.McD.)

A NEW SPECIES OF OAK GALL AND ITS MAKER.

BY B. W. WELLS AND Z. P. METCALF,
North Carolina State College and Experiment Station.

The gall described below was discovered on *Quercus marylandica* Muench., near Raleigh, North Carolina, by the senior author who was impressed by its unique characters. The specimens were brought into the laboratory and the adults reared. These adults may not belong to the genus *Andricus* but awaiting a thorough revision of the Cynipid genera they may be placed there provisionally.

The gall is very different from any other North American cynipid cecidium in the possession of the curious peltate bract-like appendages, which are borne on and constitute a part of the gall proper; in the usual situation with bracted galls the bracts are borne beneath the larval cell or cells, representing aborted leaves. The adult insects emerged about June 1st.

Andricus peltatus, n. sp.

Female.—Black, with legs and antennae testaceous yellow. Head: black, mouth parts testaceous yellow, surface uniformly but finely punctate and sparsely covered with rather long whitish pubescence; cheeks rather narrow, but more than one-fourth of the length of the long diameter of the eye. Antennae four-

teen-segmented; first and second segments enlarged, third segment one-half again as long as the fourth; segments five to thirteen nearly equal in size, segment fourteen conically attenuated, all the segments with rather heavy yellowish pubescence; segments one and two yellow testaceous, the others blackish. Thorax: black; pronotum rather coarsely punctulate with rather uniform yellowish white pubescence; mesonotum smooth, polished, parapsidal grooves deep, rather close together at the scutellum widely divergent anteriorly; scutellum coarsely and irregular rugulose, very sparsely pubescent. Legs: yellowish testaceous rather uniformly covered with paler pubescence ; basal, tarsal segment shorter than 2 to 5 ; wings transparent, veins brownish, areolet small. Abdomen: highly polished, second segment about as long as the rest of the abdominal segments united, second segment with a few sparse hairs laterally. Length average 2.4 mm.

Holotype. Female, bred from galls on *Quercus marylandica* Muench., Raleigh, North Carolina deposited in the United States National Museum.

Paratypes. Three females and one gall in the collection of the United States National Museum, bred from similar galls.

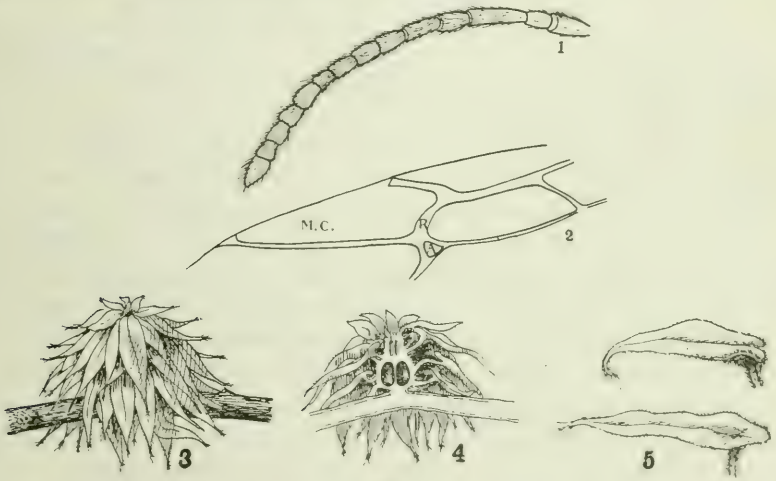


Fig. 2. 1. *Andricus peltatus*, Antenna. 2. *Andricus peltatus*, portion of wing showing radial vein (R) marginal cell (M. C.) and areolet (A). 3. Dithalamous gall (x 1). 4. Median vertical section of preceding (x 1). 5. Two bract-like appendages from gall showing peltate character (x 2).

Andricus peltatus Wells and Metcalf, Cecidium nov.

On *Quercus marylandica* Muench., sessile on stem at nodes (originates from apical meristem of lateral bud) on branch portions from 1-5 years old; prosoplasma, concentric type with up-walled superstructure; flask-shaped, the neck bearing numerous, sparsely hairy bract-like appendages which are reflexed and overlap shingle fashion. Appendages greenish with red-tinged hairy tips, peltate, lanceolate, stalk short. When young very thickly covered with acicular trichomes some of which are of the compound stellate type ; 8-14 mm. high, 14-22 mm. wide at base including appendages ; 1 or sometimes 2 larval cells in proximal half (Fig. 4), distal false chambers corresponding, walls thick, thin sclerotic layer differentiated around nutritive layer lining the chamber; rare, Raleigh, North Carolina. Types in collection of B. W. Wells. The above description is based on six mature and four immature specimens.

THE NORTH AMERICAN SPECIES OF THE ANTHOMYIID GENUS HEBECNEMA SCHNABL (DIPTERA).

BY J. R. MALLOCH,
Urbana, Ill.

This genus differs from *Helina* R.-D., to which it is most closely allied, in having the prealar bristle absent, arista invariably plumose, fifth abdominal sternite in male with a deep U-shaped posterior excision, and the female genitalia without a pair of long slender apical processes.

KEY TO SPECIES.

1. Species entirely fulvous yellow ..... *fulva* Bigot
   Species with thorax and abdomen entirely black 2
2. All femora and tibiae reddish yellow ..... *pallipes* Malloch
   Mid and hind femora and all tibiae reddish yellow .. .. .. *nigricolor* Fallen
   All femora and usually tibiae also black 3
3. Abdomen without a dorsal central black vitta, sometimes with one or two pairs of very indistinct blackish spots .. .. *fumosa* Meigen
   Abdomen with a very distinct dorsocentral black vitta 4
4. Halteres with black knobs; abdomen in female entirely glossy black without pruinescence .. .. *vespertina* Fallen
   Halteres with yellow knobs; abdomen in female with distinct gray pruinescence 5
5. Male abdomen broadly ovate, with pearlaceous gray pruinescence, and an almost linear black dorsocentral vitta; mid femur with a few long fine bristles at base on posteroventral surface; head hardly flattened above; eyes hairy .. .. *umbratica* Meigen
   Male abdomen narrowly ovate, with brownish gray pruinescence, and a broad black dorsocentral vitta which tapers posteriorly; mid femur without distinct bristles basally on posteroventral surface; head of male distinctly flattened above; eyes bare .. .. *affinis,* sp. n.

I have included *fumosa* and *nigricolor* though so far they have not been recorded from this country. It is, however, not improbable that they will ultimately be found to occur either in New England or the northwest.

Hebecnema affinis, sp. n.

Male.—Black, almost glossy. Thorax and abdomen with brownish gray pruinescence, the former very indistinctly vittate, the latter with a broad, black, dorsocentral vitta which tapers posteriorly. Legs black, the tibiae paler. Wings infuscated, more conspicuously so basally and anteriorly. Calyptrae whitish yellow. Halteres yellow.

Head rather conspicuously flattened above; eyes bare, separated at narrowest part of frons by a distance equal to width across anterior ocellus; each orbit with three or four bristles and some weak hairs anteriorly; parafacials almost invisible from the side; third antennal segment over twice as long as second; longest hairs on arista longer than width of third antennal segment. Thorax normal. Abdomen narrowly ovate; basal sternite in type with a few hairs, in other specimens bare; fifth sternite normal. Legs as in *vespertina,* except that the mid femora lack distinct bristles basally, and there are two anteroventral bristles on hind tibia.

Female.—Very similar to the female of *umbratica,* but the eyes are bare

and the abdomen more distinctly speckled.

Length, 5 mm.

Type, male, Rutland, Vt., August 1-15, 1916.

Allotype, Auburndale, Mass., June 22.

Paratypes, one male, Mt. Greylock, Mass., June 15, 1906; one female, Bar Harbor, Me., July 30, 1919.

Type in collection of Boston Society of Natural History.

I have no doubt whatever that this species occurs in Europe, where it is confused with *vespertina*, as Stein in one of his recent papers on European Anthomyiidae states that *vespertina* varies in the colour of the halteres, having them sometimes black and sometimes yellow, and in the number of bristles on the anteroventral surface of the hind tibia. I have found only one male of *vespertina* which had two anteroventral hind tibial bristles and that was on one tibia only. The colour of the halteres in both sexes of *vespertina* is black while in the new species they are yellow in both sexes.

BOOK REVIEW.

CONTRIBUTIONS TO THE NATURAL HISTORY OF THE LEPIDOPTERA OF NORTH AMERICA, VOL. IV., NO. 4.

—The Pterophoridae of North America—by Wm. Barnes, M.D., and A. W. Lindsay, Ph.D.

The final number of Volume IV. of the well-known "Contributions" contains a noteworthy monographic revision of the North American 'plume-moths'. This interesting family has been much neglected by American entomologists during the past twenty years; in fact since the publication of the Fernald monograph in 1898 only a few sporadic descriptions of new species have appeared and with each year the difficulties connected with the correct determination of material in this group have become greater and greater. The present paper should obviate all this for besides 170 pages of text there are included 7 plates containing most excellent enlarged photographic reproductions of the primaries (and in some cases of the secondaries) of all the North American species, and in addition 7 plates dealing with structural details (wing venation and male genitalia).

Great care has been taken to establish the correct synonymy of each species. A large proportion of the existing type material has been personally examined and in cases where this was not possible, careful comparisons have been made by well-known specialists with material sent from the Barnes Collection. A number of changes in specific synonymy—some of them quite startling—have resulted, but these appear to be thoroughly well authenticated and must be accepted.

The greatest changes, however, are to be found in the generic nomenclature. Following what we believe to be the only course, if stability of nomenclature is ever to be attained, the authors have adhered strictly to the International Rules of Nomenclature and the opinions rendered by the International Commission on Nomenclature. According to these rules a genotype is not fixed until one of the originally included species in the genus in question has been definitely cited—either at the time the genus was created or at a later date—as

the type, all so-called 'restrictions' previous to such a time being invalid (vide Opinion 46). This latter clause has been the subject of much adverse criticism and is even now not observed by numerous Lepidopterists ; for a very able discussion of this point we would refer the reader to a recent paper by Dr. J. C. Bradley in the Transactions of the Entomological Society of London for 1919, page 51.

As a result of a strict application of the above rules for the first time to the *Pterophoridae* we find *Oxyptilus* Zell. superceded by *Pterophorus* Geoff. (type, *didactyla* Linn.) and in place of *Pterophorus,* as generally used, following Walsingham, Fernald and Meyrick, we have the term *Oidaematophorus* Wllgn. *Platyptilia* Hbn. is used in its old established sense but *Alucita* Linn. is correctly referred to *hexadactyla* Linn., supplanting *Orneodes* Latr. The four species included under it in the Barnes and McDunnough Check List are distributed in the genera *Aciptilia* Hbn., *Pselnophorus* Wlshm. and *Adaina* Tutt., to which latter genus are also referred several species formerly included in *Pterophorus.*

The only adverse criticism of the above changes that could possibly be made is that Lamarck's Systeme des Animaux sans Vertebres (1801) has not been accepted by the authors as fixing genotypes. The point is still a mooted one and has been touched upon by Dr. Bradley in the above mentioned paper. It is a great pity that the Secretary of the International Committee, Dr. C. W. Stiles of Washington, connot be prevailed upon to secure an early vote on this subject, as until this matter and the one concerning the validity of Hubner's 'Tentamen' are definitely settled, no stability in the generic conceptions of the Lepidoptera is possible. In the present instance, if Lamarck had been recognized as fixing genotypes, it would have been permissible to employ both *Oxyptilus* Zell. and *Pterophorus* Linn. in the generally accepted way.

The monograph deals with 117 species of which 31 are new to science, the greater proportion of these new species being from the southwestern states and referable to the genus *Oidaematophorus.* Keys to the genera and to the species are included and a full bibliography is given. The authors are to be highly complimented on the thoroughness of the work and it is to be hoped that through its means a fresh impetus will be given to the study of these interesting forms, the biology of which in so many cases is still completely unknown.—J.McD.

CORRECTIONS.

Page 152.—Table of Species, couplet I, second section, change to read "Disc of Thoracal squamae not pilose."

Page 153.—Couplet 9, second section, change to read, "Face without median black stripes."

Page 152.—*Syrphus ribesii,* sixth line, change "of" to "or" and read "tip, or apical sixth."

C. H. Curran.

Mailed Dec. 8th, 1921.

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POPULAR AND PRACTICAL ENTOMOLOGY.

THE LIFE HISTORY OF A HOBBY HORSE.

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PART III. SECOND CHILDHOOD—THE TREE'S INCLINE.

(Continued from Page 199.)

In spite of considerable study in the Science of Botany, I remained an incorrigible amateur, loving the wild flowers for their beauty, and to a great extent ignoring unsightly or inconspicuous weeds. But wherever a genus or a family of plants had any attractive species among them, it kindled one's eagerness to run to earth as many members of the family as possible.

The very first flower of the season opened up half a hundred avenues rich with surprising discoveries. This was the charming little Hepatica, pride and prime of Ontario's spring—the true Canadian primrose. The flower in itself is beautiful, of a delicate mauve, sometimes almost pure white, sometimes as pure pink or blue, and ranging through all the shades of purple or lilac between these extremes; it is true that during its short blossoming season, the plant can show only last year's leaves, darkened in the weather; but the little communities of blossom are so closely clustered, and their stems so dainty with soft silk, that the absence of foliage is hardly noticed, and before the bloom falls the new young leaves have already pushed up their 3-lobed fans all clothed with silver down; sometimes the blossoms are fragrant; they are always beautiful; like the May Flower or Trailing Arbutus of the Atlantic Provinces, well worthy to be a national emblem; it is common everywhere in the Dominion from the Atlantic to the Pacific, and—surest test of all—a prime favorite with the children. With me it was a clear case of love at first sight; but then I was always just as eager as any child to race to the woods after school and make friends with the Spring flowers.

About half a mile from the town, just east of the Brockville road, was a steep wooded ridge with a southern slope, and beyond it a spacious hardwood bush. It was on my first trip to this place that I received my initiation at the hands of the Science teacher; and evidently the news of this spread, for the pupils greeted me next day with grins broad or shy according to their nature. It was only a small piece of Indian turnip that I was given to chew, and at first—such is the diabolical cunning of the fiend that dwells in the corm—the flavor was soft and cool like a parsnip; I had, in fact, already spat the gobbet out before the burning began; but once the poisoning (for it is nothing less) first showed its symptoms, it grew at deadly pace to an intolerable burning; even next day there were still countless little crimson specks on my tongue. I cannot describe the sensations better than by saying that it brought back vividly to my mind the red horror of a far-off day in the nursery when I purloined from a cupboard half a small salt-spoonful of Cayenne pepper and ate it in

pleased anticipation based on its pretty colour. I must have been very small at the time, for I made my way down the backstairs to the kitchen, clambered onto a chair and so into the sink, where I was found presently by the cook, sitting with my tongue out under the cold tap, trying in vain to put out the fires.

Hepatica was still cropping up everywhere on this slope and among the leaves in the wood, when I discovered my first Bloodroot and Dog Tooth Violets. And here began a new chapter in the romance, for the Bloodroot I found was a "poppy" and the so-called violet or Yellow Adder's Tongue no less than a wild "lily." This path of botanical kinship was full of surprising turns, you never knew what you'd find just round the corner. It had all the comicality of a 3-legged race, with its dot-and-carry-one of incongruous pairs, columbine and kingcup, leek and orange lily, wood-nettle and elm, linking it along together. The day of the dog-tooth violet was also the day of my first real violet, the little white fragrant kind of the swamp; and in a few days I had found three or four species, each in turn more beautiful than its fellows, all with the same sweet wistfulness in the face of them and delicate pencilling of eyelashes. It was while I was still bending over the violets, as it seems to me, that I suddenly noticed the woods were full of fairy troops; they had stolen a march upon me; really the best way to see the fairies is to pretend you're not looking for them; then they peep out from under the leaves and creep from the hollows. They were all round me—"Jack-in-the-pulpit," the "Steeplechimes" of New York's Governor (Clintonia), Bellwort, Wild Lily-of-the-Valley, Trilliums, Wake-robin, Twist-stalk, Solomon's Seal, Indian Cucumber, Ladies' Slippers, Wild Ginger, Goldthread, Baneberry, Crinkleroot, Dutchman's Breeches, Squirrel Corn, Bishop's Cap, Foamflower, Cranesbill, Milkwort, Shinleaf, Starflower, Lousewort, Twinflower; what magic names and forms to conjure with, and bring the whole rout of Titania's court abroad among the maples! "A wood near Athens," or a sugar bush in old Ontario—what odds to the little folk?

It was from these beginnings that I swung down the great avenues of Flowering Plants; the way of Arrowhead and Arum, of Lily and Orchid; the way of Sweetgale, Sandalwood and Birthwort; the way of Crowfoot, Pink and Poppy, Sundew and Saxifrage, Rose, Jewelweed and Mallow, Enchanter's Nightshade and Bunchberry, all flowers with petals kept apart; and last, the way of the flowers with welded petals; and these, after the Lilies and Orchids, were my favorite flowers; fortunately, their prime was after midsummer, somewhat later than the hey-day of the Polypetalous tribe, so that I could dally awhile with the latter, before I need devote all my time, as sooner or later I must, to the beautiful Heaths, the Primulas and Gentians, Bluebells and Lobelias; but perhaps above all, to the great phalanx from Borage to Bladderwort, headed by the incomparable Figworts; in this family with its Speedwells, Turtleheads, Beardtongue, Monkey Flower, Hedge Hyssop and Gerardias, cousins of the lovely English Foxglove, I was never tired of working; adding species to species, and genus after genus, till every gap was filled.

The countless paths of marvel revealed to me along the way have served to fill a score of summers to the brim with beauty, and still no sign of exhaustion; they have made the addition of Ferns and Club-mosses to the Flowering Plants,

the visits to a new district, the tramps in England and Wales, the trips to Ireland and Scotland, one long revel of delight; and what began it all? A few hours of drudgery with a botanical key and half a mile of common dusty road, trodden casually one April afternoon at the end of a day in school.

After two years in Smith's Falls I accepted a private tutorship in the neighbouring town of Perth, with headquarters at the Rideau Lakes from April to October. My pupil was as ardent a nature lover as I was myself and there grew up between us a close friendship of the give-and-take kind. His paradise was bird land, and if I taught him half as much about flowers in our long summer rambles as I learned about birds, we have both good cause to be grateful.

No one can haunt the countryside for flowers so constantly as I did without storing up quite a fund of mental notes, conscious or unconscious, about their fellows, furred and feathered. Where I had missed at first the Skylark from the meadows, I came to look for the Horned Lark, the Meadow Lark, the Song Sparrow, the Vesper and the Bobolink; if I could no longer hear the Blackbird and the Thrush, I could listen to the Bluebird and the Robin, and train my ear to tell apart the notes of the Catbird and the Oriole; while, in the woods themselves, I learned to trace to their source a score of mysterious notes from Cuckoos, Flycatchers, Thrushes, Vireos and Warblers —the Wetfoot, the Wood Pewee, the Veery, the Oven Bird, the Redeye and the Yellowbird. About the swamps and marshes of the Rideau abounded Grackles and Soldier-birds, Mudhens, Grebes, Bitterns and Herons; sometimes we flushed a Woodcock or caught a rare glimpse of Gallinule, Green Heron or Least Bittern. It was here that I first met the Great Northern Diver, the immortal Loon, and learned to admire its mastery of the watery element. One day, too, on the Lower Rideau, I had a unique experience; I was trolling slowly round a small island within a few yards of its wooded shore when I surprised a loon on its nest; in a flash it scrambled down the bank and made a running dive for the open, actually passing just under the bow of my little skiff; I could see the bird so distinctly as to note the powerful oarage of its great black webs, but what astonished me most was to see that its wings were not closed tight to the sides, but thrust partly forward and out, so that the water streamed away in greenish bubbles over the edge of the pinion; the wings must of course be used like fins to keep the bird on an even keel and plane up or down when submerged in its limpid depths.

Soon after dusk the loon suffers disembodiment and all night long you may hear from some abode of lost souls its wild cries and shouts of maniacal laughter. Sound is the strangest of all our bodily sensations; objects of sight have nothing mysterious about them; there they are before us plain to the view, and easily verified if we choose by touching or handling; but sounds are a thing apart, unsubstantial, the ghosts and wraiths of the ear. Ever since the race was in its infancy men have broken their hearts over an echo, and pined away with infinite yearning; we have peopled the night with all kinds of fabulous beings to be known only by their cries; the cuckoo, the white throat, and even the nightingale owe their charm to being hidden; to see the singer is to touch the magician and his virtue departs. When night or the leafy screen of the forest seals up the eyes, what a dance the imagination is led through that

other channel of sense, the ears! From earliest childhood, the voices of the night minister in each of us to the race's instincts of superstition and awe; the wind whistling in the chimney or rattling at the window, sighing and sobbing like some lost spirit; the weird music of the Whip-poor-Will or the Night Jar, the boding cry of the owl, the demoniac laugh of the loon, have all the power to call up ghoulish forms of primitive animism in our minds, out of the long dormant paganism of our past; come dawn and the sunrise, we chase them away for empty phantasms with a single sweep of the eye.

I remember, one autumn, a boy called in to ask my pupil over to his father's farm; a wild cat had been heard in the neighborhood, and he had better bring his gun. The next hour or two I spent in rapt attention to story after story about wild cats, lynxes and wolverines; their cunning, their daring and ferocity. Late at night the huntsman returned after a fruitless chase; several times he had heard the animal, but always at a distance, and nothing could be seen. Night after night the cries were repeated and gradually the thing grew bolder; till at last its cries were heard quite near our own cottage proceeding from a little orchard; my pupil stole out with the gun, and presently we heard a shot; the wild cat was dead; it was a little grey Screech Owl, one of the most beautiful creatures I have ever seen. Its cry is a long quavering whistle that comes rippling down the scale through several notes, quaintly suggestive of a pony's whinny; like so many of the owl-cries it is curiously deep, full and liquid, as though born of hollow wood and issuing from a vault more spacious than channelled reed-pipe.

About a mile away through field and wood lay a small lake famed afar for its bass. In stormy weather gulls came up the Rideau from the St. Lawrence, and on "Bass" Lake at such times we used to see a very beautiful bird from the coast known locally as the Sea-swallow; much smaller than the common Gulls, very graceful in flight, and with long narrow wings, perhaps the Least Tern.

In the height of the summer as we came home late at the end of a day's fishing, the groves seemed fairly alive with Whip-poor-Wills flogging the night with their strange whip-lash of a cry. It is not nearly so common a sight as its cousin, the Night Hawk, being more shy and seeking the seclusion of the woods both for feeding and nesting. The Night Hawk lays its eggs right in the open; often, in the city, its eggs may be found on the flat roofs, over which it flies hawking all the evening, or even in broad daylight when skies are grey. Both birds, though utterly defenceless, if surprised on their nest, will fly in the face and flutter threateningly just like the partridge. I remember the first time I went to the village of Lanark, in a search for orchids, what crowds of Night Hawks were in sight feeding over the swampy woods. Just outside the village was a high rocky ridge overhanging a great swamp of spruce, cedar and tamarac. After sundown at the end of my day's botany I would take up a position on the top of the slope to watch these birds; there were often two or three score of them in sight at once; they usually hunted in couples, though sometimes a string of five or six would go together (perhaps all of one sex) in zig-zag flight and with sharp cheeping cries; on a calm evening they seemed never to tire of their favorite game of diving; sometimes one of a pair (probably the male) would climb high up and then drop like a plummet past its mate in a

nose dive almost to the ground, when out shot the pinions and the tail seemed to flatten back as the daring aeronaut glided into the horizontal with a booming whirr of air through its feathers. If the game never palls on the bird, it certainly never palls on the human spectator, let him once contrast the clumsy barging movements of his own earth-bound body with the airy grace and swift power of living wings.

The finest spectacle of flight I ever watched was a game of just this kind played by a pair of bald-headed eagles on the Rideau. Here the birds took turns in soaring and diving, one bird floating almost motionless in mid-air while its mate soared in a bold spiral of immense sweep; suddenly from the dizzy top of its staircase the climber stooped, and plunged sheer down through the walls of space, apparently almost grazing the still form of the other in its descent; then with a faint bark or two of enjoyment it would flap and glide its way up into position to sleep outspread in mid-air, the floating target for its fellow's plunge. At first, as I have said, they took turns in this daring sport, and the game seemed to develop fresh variations in the very practice of it; sometimes there was a skirmish in mid-air, one dashing at the other on the level as though lunging out from the shoulder with a full-face blow; this the other would avoid by a sudden side-step or an upward leap; once the bird on guard stood its ground, and at the very instant of the fearful impact, suddenly the pair of them shot up in a double-headed geyser, rising rampant face to face, like game-birds at a cocking main, in the heat of their fierce encounter.

(To be Continued.)

THE NYMPH AND BREEDING PLACE OF AESHNA SITCHENSIS HAGEN (ODONATA).

BY E. M. WALKER,
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Aeshna sitchensis Hagen, one of the two smallest and most northern species of the genus in North America, has been known since 1861, but though it has been taken in a number of localities since then, from Atlantic to Pacific, almost nothing has been recorded concerning its habits and haunts.

The first time I came upon this species in numbers was on June 29, 1913, at Banff, Alberta (4,500 ft.). They were flying over a partly cleared area on the side of Sulphur Mountain below the Upper Hot Springs, probably not more than 500-600 feet above the town. All were young individuals with the colours not yet quite mature, so that I felt reasonably certain that if I could find their breeding place, the exuviae would be present and perhaps nymphs would be obtainable. Accordingly I searched all the likely looking ponds, lakes and streams I could find in the neighbourhood; but, although Aeshna nymphs and exuviae were found, they all belonged to *A. palmata* and *A. interrupta*.

During succeeding years, although I spent some time in northern localities, where this species is regional, I found no trace of it until the season of 1921. In July of that year I was again collecting in Banff, but spent two weeks there without seeing *Ae. sitchensis* at all. After visiting the Pacific Coast, however, I returned to Banff, spending a day and a half (Aug. 5 and 6) on the way at Field, B.C. (4,072 ft.).

About two miles west of the station, on the north side of the river, I found, at the foot of a mountain, a small mossy bog, fed by springs and by the seepage from a small cold mountain brook. The bog was partly enclosed by spruce forest and supported a scattered growth of stunted white spruce and willows, shrubby cinquefoil, and a few other swamp plants, but, excepting the moss, which was partly submerged, there was practically no aquatic vegetation, neither standing nor floating. Here were two species of dragonflies flying and ovipositing. One was *Somatochlora franklini* Selys, the other *Aeshna sitchensis*. The latter was the commoner of the two, but was far from numerous, the bog often appearing for many minutes at a time to be devoid of dragonfly life.

The males of *A. sitchensis* flew low, as a rule, only a foot or two from the ground, sometimes apparently at random over the bog, sometimes following the stream for some distance, but not covering a definite beat. They flew less swiftly than most Aeshnas and frequently dropped to the surface of the water for an instant, in a manner somewhat suggestive of an ovipositing female.

The females were frequently observed ovipositing in the wet moss about the edges of the small puddles in the bog, many of which were less than a square foot in area. The manner of oviposition was quite like that of other Aeshnas. The insect would light on the moss and thrust the abdomen into it in various directions, following no regular plan. Usually she remained at one spot less than half a minute, then flew on a few yards and repeated the operation. Once or twice copulating pairs were seen to rise from the bog and fly to the neighbouring trees.

A prolonged search was made for nymphs and exuviae, but although *Somatochlora* exuviae and a few young nymphs were found, no trace of the early stages of *sitchensis* appeared.

I was now, however, on the right track. I had at last penetrated the mystery of this strange dragonfly's haunts, which proved to be the same as those of the equally little-known *Somatochlora franklini*. It may be recalled, however, that the correct solution of this puzzle was already hinted at by Mr. F. C. Whitehouse (Can. Ent., XLIX, 1917, p. 100), who says: "I incline strongly to the opinion that the true breeding of this northern insect is muskeg, which may account for the nymph being still unknown."

On August 5 I left Field and arrived at Banff on the same day. I told my friend, Mr. N. B. Sanson, Curator of the Rocky Mountain Park Museum, of my experience at Field, whereupon he kindly offered to conduct me to a bog which he thought might prove interesting in a similar way. This bog, which we visited on August 9, is at the foot of Mount Rundle, and proved to be very like the one at Field, but much larger and in every way more productive. It appeared to be fed by seepage from a cold mountain stream. At the lower end of the bog there were two or three small ponds around which cat-tails and other standing aquatic plants grew, but the water was very cold and no dragonflies were seen in this part. The upper and middle parts of the bog were mossy and practically without standing aquatic plants and the open areas of water were mere puddles like those at Field. The water here was also warmer. One could walk through it without sinking more than a foot or so, if careful to pick out the firmer-looking moss hummocks.

As in the case of the bog at Field, there were very few dragonflies here, but I soon observed *A. sitchensis* flying and ovipositing as before, and soon afterwards a *Somatochlora* was seen and captured. It was not, however, *franklini,* but a species which at present has no published name. *Somatochlora* exuviae were rather common and I obtained a full grown nymph, but for some time I found no trace of Aeshnas. After further search I found an exuvia, but was disappointed in recognizing it as *juncea,* a species that is abundant here about the small ponds in the marsh along the railway track, where I found many of the exuviae. At length, however, I found four small Aeshna exuviae of the penultimate stage, to judge by their wing-length, and one slightly larger exuvia of the final moult. These, which from their small size I had no doubt were *sitchensis,* were supplemented by three others on the following day. Males and females are represented by both stages.

These nymphs look like miniatures of *A. interrupta* or *eremita,* but resemble still more closely that of *A. coerulea* Ström, which was described recently by F. Ris (Mitteilungen der Schweizerischen Entomologischen Gesellschaft, Bd. XII, pp. 348-354, Taf. XIX, 1916). This was to be expected, as these two species are very nearly related and together form a distinct section of the genus Aeshna. The haunts of *coerulea* in Switzerland, as described by Ris, are also strikingly similar to those of *sitchensis,* as indicated by the following passages:—"es war an sehr mässig ansteigender Talflanke eine kleine, flache, ganz von Quellen ausgefüllte Mulde, ohne grössere Wasseransammlung, teilweise torfig, hauptsächlich aber über schieferigem Geroll mit massenhafter Vegetation von Saxifraga aizoides." (Op. cit., p. 350); and again, concerning another locality: "Sie flug nicht am See selbst, sondern auf quelligem und torfigem Gelände in seiner unmittelbaren Umgebung."

Aeshna coerulea is a circumpolar species, occurring in North America as the race *septentrionalis.* I took a single specimen of this form at Banff, in 1913, flying with *sitchensis,* and it is very probable that it breeds in the same places as the latter, though apparently very rare here.

Description of the Nymph.

Nymph small and rather slender. Head as in *juncea* and *interrupta,* broadest across the middle of the eyes, which are a shade more prominent than in *interrupta.* Lateral margins of head short, passing through well-rounded angles into the posterior margin, which is straight or feebly excavated when viewed directly from above. Mentum of labium reaching back to middle of mesocoxae, very like that of *eremita* in form, basal breadth about three-fifths of the apical, greatest breadth four-fifths of the length; the sides nearly straight and feebly divergent from base to a point just beyond the middle, distad of which they are strongly arcuate. Middle lobe prominent, narrow and obtusangulate, resembling that of *juncea* closely. Lateral lobes broad, the terminal parts subequal, squarely truncate, outer angle scarcely rounded, inner angle with a minute tooth. Supra-coxal processes rather short and blunt, subequal in length, the posterior slightly the stouter, the interval nearly rectangular. Abdomen broadest at segments 6 and 7, a little slenderer than in *interrupta*; lateral spines present on segments 7 to 9 only, those of 7 minute rudiments, those of 8 extending half way to the base of seg. 9, those of 9 as far as the

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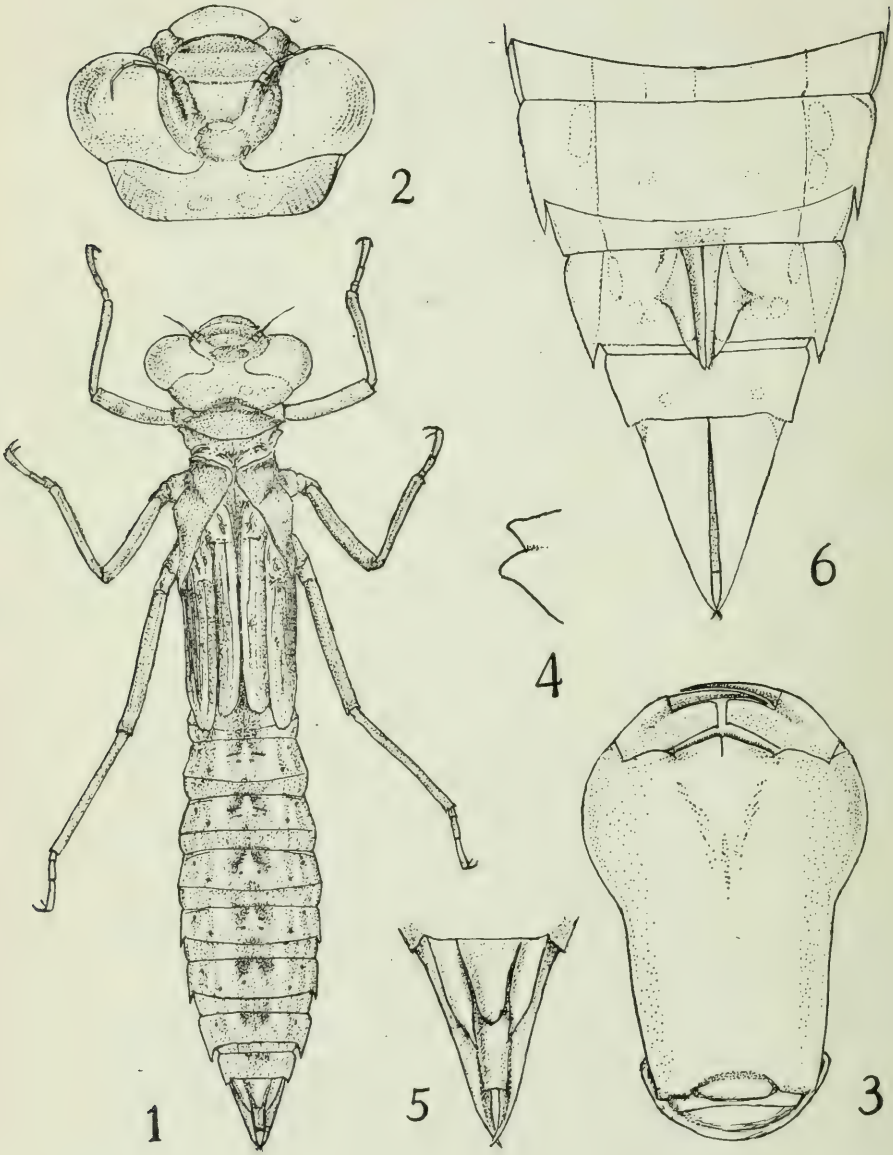
Plate VIII



THE NYMPH OF AESHNA SITCHENSIS HAGEN

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proximal fourth of 10. Inferior appendages scarcely longer than segs. 9 and 10 together, their apices distinctly incurved; median superior appendage about one-fourth shorter, the basal tubercle in the male triangular, with a blunt, rounded apex, about three-fourths as long as the paired superior appendages (lateral appendages), which in the male are rather more, in the female barely less, than half as long as the inferior appendages. Ovipositor extending over about one-fourth to one-third of seg. 10, the lateral gonapophyses (genital valves) a little shorter, just about reaching to the base of that segment.

Colour Pattern. Head almost uniform brownish, thorax with traces of paler mottlings in some specimens. Legs nearly uniform, with more or less distinct traces of two or three pale femoral bands, a median, an anteapical and sometimes a basal band. Abdomen brownish with pale markings almost exactly as in *eremita* and *interrupta*. Extending practically the entire length is an ill-defined brown median band, which tends to deepen in front of the dorsal punctae, typically forming paired submedian, $\wedge$-shaped spots at the front margins of most of the segments. This band is bordered laterally by a pair of pale bands, which are most distinct on the anterior segments, and on the anterior part of each segment, forming in dark specimens a subcontinuous series of pale spots. Laterad of these bands is a series of subcrescentic pale spots and a broad marginal pale area, just enclosing the lateral scars, which are outlined in brown. Punctae all dark brown.

Length of body 31.5 to 32.5 mm.; mentum of labium 4.5 to 5.0 mm.; hind wing-pads 7.5 mm.; hind femora 5.5 mm.; inf. apps. 3.0 to 3.25 mm.; ovipositor 2.25 to 2.5 mm.; width of head 7 mm.; width of abdomen 6 mm.

The immature exuviae are similar to the full-grown examples, except in size and length of wing-pads and genitalia. The paired superior appendages of the males are only about three-eighths the length of the inferior pair, and the ovipositor does not quite reach to the posterior margin of seg. 9 . The colour pattern is similar but darker, and with more distinct markings than in most of the full-grown exuviae. All are of about the same size and the measurements are as follows:—

Length of body 29 mm.; mentum of labium 3.5 mm.; hind wing-pad 3.5 mm.; hind femora 4.5 mm.; inferior appendages 2.75 mm.; ovipositor 6.0 mm.; width of head 6.0 mm.; width of abdomen 5.5 mm.

As these exuviae evidently belong to the penultimate stage and as the period of emergence was long over when they were taken, it is evident that the nymph of *Aeshna sitchensis* enters the last stage during the season before that in which it emerges. This appears to be the usual habit in boreal Odonata.

As compared with Ris's description and excellent photographs of the female exuvia of *A. coerulea*, that of *sitchensis* is seen to differ very little except in the form of the labium and the somewhat shorter caudal appendages. The body of *sitchensis* is somewhat more slender, as is also true of the adults, and the head is a little wider than the thorax, whereas in *coerulea* it appears to be of about the same width. The mentum of the labium is distinctly broader in *sitchensis*, its greatest breadth being equal to fully four-fifths of its length, while in *coerulea* it is equal to about two-thirds of its length. The inferior paired appendages, besides being shorter, appear to be more strongly incurved

at the apices than in *coerulea*, though the curving is quite noticeable in the figure of *coerulea*. The lateral spines on segments 8 and 9 of the abdomen appear to be a trifle shorter in *sitchensis*.

The nymphs of these two related species are readily distinguished from all other known nymphs of North American species of *Aeshna* by the entire lack of lateral spines on the 6th abdominal segment. The nymph of *sitchensis*, like the adult, is on the whole the smallest of North American species, though *coerulea septentrionalis* is often no larger. *A. californica* is the only other species that is comparable to these two in its small size.

Explanation of Plate.

Aeshna sitchensis Hagen.

Fig. 1. Exuvia of full-grown male nymph. The head is slightly bent forward.

Fig. 2. Head of same, direct dorsal view.

Fig. 3. Labium (closed), ventral view.

Fig. 4. Left supra-coxal process.

Fig. 5. Caudal appendages of male, dorsal view.

Fig. 6. Terminal abdominal segments of female nymph, ventral view.

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID GENUS ERNESTIA R. D. (DIPTERA).

BY JOHN D. TOTHILL,

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(Continued from Page 205.)

Description of Species.

Ernestia (Meriania) flavicornis Brauer.

Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi yellow. Eyes hairy, cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height; sides of face covered with silvery pollen; with some weak hairs on the upper part; narrowest width equal to or slightly greater than the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments rufous; third segment about one and one-fourth times as long as the second. Arista thickened on basal two-fifths to three-fifths, the penultimate segment slightly longer than broad. Width of front in male equal to the length of, in the female equal to two and a half times the length of, the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point equal in male and twice in female the width of either side of front just cephalad of the ocellar triangle. Orbital bristles present in female, absent in male. Ocellar bristles absent in male, present and proclinate in female; the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes faintly rufous toward the apex. Three sternopleural macrochaetae and typically four dorsocentrals, although both sets are subject to considerable variation; scutellum with four marginal pairs of macrochaetae and with an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3}. Bend of M_{1+2} destitute of an appendage. Radio-medial cross vein cloudy. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. No discal macrochaetae present on the second abdominal segment, but a pair on each of the following segments; marginals present on the second, third and fourth. The hind margin of the third tergite not arcuate even in the male. The fifth tergum in the male marked off distinctly by a suture from the fourth and about one-fifth as long as the fourth. The sixth and seventh abdominal segments forming genital segments that are noticeably smaller than in *E. ampelus* Walker and the other species described in this paper.

Genital segments of the male black. The basal part of the outer forceps not covered by a leaf-like expansion. The basal part of the inner forceps without a median keel-like projection; the distal part forming a straight, bayonet-shaped blade.

The indenture in the last sternite of the male extends to the base of the sternite so that the sternite is split longitudinally into two halves.

Redescribed from six males and four females in the U.S.N.M. collection and in the Canadian National collection. Collected from the White Mountains, Franconia, N.H.; Mandan, N.D.; Cranbrook, B.C.; and Lillooet, B.C.

Ernestia (Meriania) nigrocornea sp. n.

Description of Male. Head at vibrissae about as thick as at base of antennae, vibrissae far above the oral margin. Palpi reddish. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground with black hairs on the subshining part, coming nearly up to the eyes and with a row of stouter hairs at the oral margin. Distance from the oral margin to base of eye equal to about one-half the eye height. Sides of face silvery pollinose; bare, except for a few sparse hairs, particularly at the upper part; narrowest width equal to about twice the length of the second antennal segment. Facial ridges bristly on lowest third. Facial depression silvery pollinose without any carina. Antennae reaching lowest three-fourths of the face, all three segments black or very dark-brown in color; third segment about twice as long as the second. Arista thickened on basal half; the penultimate segment scarcely longer than broad; width of front at narrowest point measuring about twice the length of the second antennal segment; silvery pollinose; frontal vitta dull, dark-reddish brown, at narrowest point measuring almost half the width of front at vertex. No orbital bristles; the frontal bristles extending nearly to the base of the third antennal segment. Ocellar bristles well-developed and proclinate..

Thorax subshining, black, covered with gray pollen; scutellum gray

pollinose on a black ground, tinged reddish at the apex. Three sternopleural bristles and four pairs of dorsocentrals; scutellum with four pairs of marginal bristles and an apical pair that may, or may not, be cruciate. (These are broken off in the type specimen). Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs at the base on both the upper and lower surface. M_{1+2} with a distinct appendage at the bend. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground, the lateral parts of the first three segments somewhat rufous. Discal bristles absent on segments one, two and three, a pair of median marginal macrochaetae on segments two, three and four. The fifth tergum distinctly marked off from the sixth; the greatest width of the fifth equal to about one-fifth the narrowest width of the fourth segment. The sixth abdominal segment about three-fourths the length of the fourth and forming a conspicuous genital segment.

The black-colored genitalia are characterized by the absence of a keel-like projection at the base of the inner forceps, by the extraordinary length of the apical blade-like portion of the inner forceps and by the unusual degree of lateral compression of each of the apical portions of the outer forceps. The broad, leaf-like expansion covering the base of the outer forceps in so many of the *Ernestia* species is lacking in this species.

The indenture of the fifth sternite extends nearly to its base.

Described from a single male taken by Mr. E. C. Van Dyke at Lake Tahoe, California, on September 15th.

Type in the Canadian National Collection at Ottawa.

Ernestia frontalis sp. n.

Description of Male. Head at vibrissae about as thick as at base of antennae; vibrissae close to the oral margin. Palpi yellowish at tip, infuscate below. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments black; third segment about one and one-fourth times as long as the second. Arista thickened on basal half, the penultimate segment slightly longer than broad. Width of front at narrowest point measuring about three-fourths the width of an eye and about twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point fully twice as wide as either side of front just cephalad of the ocellar triangle. No orbital bristles, the proclinate ocellars somewhat weak; the single row of frontal bristles descending to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen, scutellum gray pollinose on a black ground that becomes rufous toward the apex. Three sternopleural bristles and typically four dorsocentrals; scutellum with three

marginal pairs of macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front-side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3}. Bend of M_{1+2} with an appendage. An unusually long costal spine. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segment. The hind margin of the third abdominal segment not arcuate. The fifth tergum marked off distinctly from the shining sixth, and at the lateral part being about one-fifth the length of the lateral part of the fourth. The sixth and seventh abdominal segments forming the not very prominent genital segments.

Genitalia black. The basal part of the outer forceps without a leaf-like expansion. The basal part of the inner forceps without a median keel-like portion.

The horseshoe-like indenture extends almost to the base of the last sternite.

Described from two males from Yukon River, Alaska, and Cranbrook, B.C., taken by Messrs. Harrington and C. Garrett.

Type Number 24,352 in the U.S.N.M., Washington, D.C., the paratype in the Canadian National Collection, Ottawa.

Ernestia johnsoni sp. n.

Description of Male. Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi yellow in the type material. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground with black hairs coming nearly up to the eyes and with a row of stouter hairs at the oral margin. Distance from the oral margin to base of the eye equal to about one-third the eye height. Sides of face silvery pollinose; bare; narrowest width of the front slightly greater than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose without any carina. Antennae reaching the lowest fourth of face, all three segments black; third segment about one and one-half times as long as the second. Arista thickened on basal two-fifths, the penultimate segment scarcely longer than broad. Width of front at narrowest point measuring a little more than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown; at narrowest point about twice as wide as either side of the front immediately cephalad of the ocellar triangle. No orbital bristles, the proclinate ocellars somewhat weak; the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground, in most specimens tinged reddish, especially at the apex. Typically three sternopleural bristles, but they are variable; typically four dorsocentral macrochaetae, some specimens with only three; scutellum with three marginal pairs of macrochaetae and with an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer

side; wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3}. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal macrochaetae present on the second, third and fourth abdominal segments; median marginals present on the same segments. The hind margin of the third tergum strongly arcuate. The fifth tergum pollinose and marked off from the shining sixth tergum by a somewhat faint suture. The greatest length of this segment is about one-fifth the lateral length of the fourth tergite. The sixth and seventh abdominal segments forming somewhat distended genital segments. Genitalia black. The basal part of the outer forceps is expanded into a broad, leaf-like portion. The basal part of the inner forceps is equipped with a short, median, keel-like projection, the two edges of which are almost straight in profile.

The horseshoe-like indenture extends very slightly more than halfway to the base of the fifth sternite.

Described from four males from Wellesley, Mass., (type locality) Melrose Highlands, Mass.; North Saugus, Mass., and Fry Creek, B.C.

One specimen bred from *Hyphantria cunea* Drury. This species should not be confused, however, with *E. ampelus* Walk., which is a major parasite of *Hyphantria*.

Type number 24,353 in the U.S.N.M., Washington, D.C. A paratype from Fry Creek, B.C., in the Canadian National Collection, Ottawa.

This species is named in honor of Mr. C. W. Johnson, whose name is inseparably associated with the Dipterology of the Atlantic seaboard.

(To be Continued.)

ON SOME CHILOPODS AND DIPLOPODS FROM KNOX CO., TENNESSEE.

BY RALPH V. CHAMBERLIN,
Cambridge, Mass.

The chilopods and diplopods here listed compose a collection made in Knox Co., Tenn., during Jan. and Feb., 1921, by Mr. Geo. G. Ainslie, by whom they were transmitted to the writer for study.

CHILOPODA.

1. *Cryptops hyalinus* (Say).

One specimen of this widespread southern form.

2. *Otocryptops sexspinosus* (Say).

One specimen.

3. *Linotaenia fulva* (Sager).

One specimen.

4. *Sonibius rex* (Bollman)

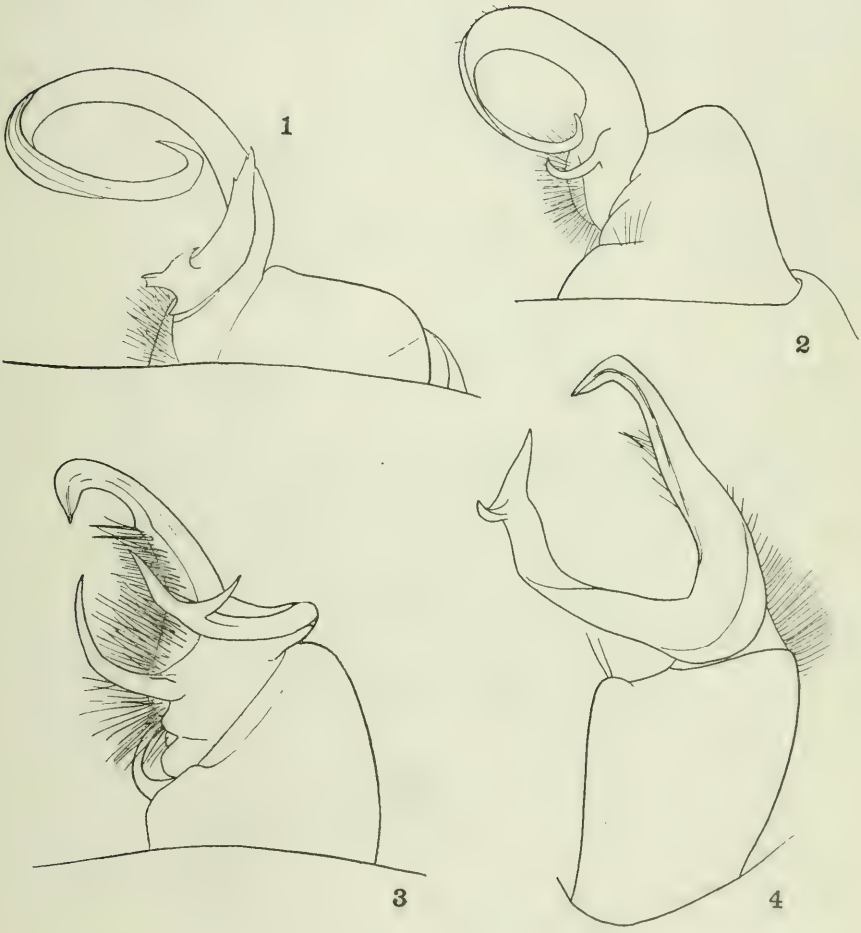
Lithobius rex Bollman, Proc. U. S. Nat. Mus., 1888, 11, p. 350.

One male of this species was taken at Elkmont, elevation 3,500 feet, on Feb. 15. It was previously known only from the type, which is a female.

DIPLOPODA.

5. *Platydesmus lecontei* (Wood).

One specimen.



CHILOPODS AND DIPLOPODS FROM TENNESSEE.

1. *Apheloria ainsliei*, sp. n., right gonopod, anterior view.
2. *Apheloria montana* (Bollman) right gonopod, anterior view.
3. *Pachydesmus retrosus* sp. n., right gonopod, anterior view.
4. The same, ectal view. All x 16.

6. *Callipus lactarius* (Say).

One specimen of this common and widespread form.

7. *Euryurus erythropygus* (Brandt).

A number of specimens, mostly not in full color.

8. **Pachydesmus retrorsus,** new species.

Above, light brown or fulvous to fuscous when in full color, with keels a lighter brown.

No processes from sternite between third or fourth legs or from any others. First joint of legs also unarmed.

The gonopods are of the same general type as in *crassicutis* (Wood), but are at once differentiated in having the spur toward distal end of outer (anterior) branch of telopodite much longer and retrorse, as well as in other details. See Pl. ix, figs 3 and 4.

Length, about 65 mm.; width, 12.75 mm.

Locality—Tennessee, Knox Co., Geo. G. Ainslie, collector.

Type—M. C. Z., No. 5028.

Apheloria, new genus.

Erected for a group of species, heretofore included in *Fontaria,* in which the telopodite of the gonopod of male is a simple, coiled blade with a small spur at base.

Genotype—*Fontaria montana* Bollman.

9. *Apheloria montana* (Bollman).

Fontaria montana Bollman, Proc. U. S. Nat Mus., 1887, 10, p. 622.

Six specimens. The gonopod as shown in Pl. ix, fig. 2.

10. **Apheloria ainsliei,** new species.

The dorsum is black or nearly so but with a broad band across caudal border and forward over keels of each segment fulvous brown to light olive, the latter being more typical; the median part of cross band sometimes obscure, but the keels always of the lighter color. Antennae dark brown. Legs fulvous.

Second joints of legs with the usual long spine; the first joints with a low conical eminence but this not at all spiniform.

This species is characterized by having the telopodite of gonopod bent into a complete circle, or a little more, and by the form of the basal spur which presents a main branch appressed to base of telopodite with apex distad and a flat dentate branch extended mesad as shown in Pl. ix, fig. 1.

Length, about 45 mm.; width, 13 mm.

Locality,—Tennessee: Knox Co. Geo. G. Ainslie, coll. Several specimens.

Type,—M.C.Z., No. 5,027.

11. *Polydesmus branneri* Bollman.

Two males taken at Knoxville in Jan., and two females taken Feb. 15.

12. *Scytonotus granulatus* (Say).

A male and two females.

13. *Parajulus impressus* (Say).

Many immature females taken 24 Feb.

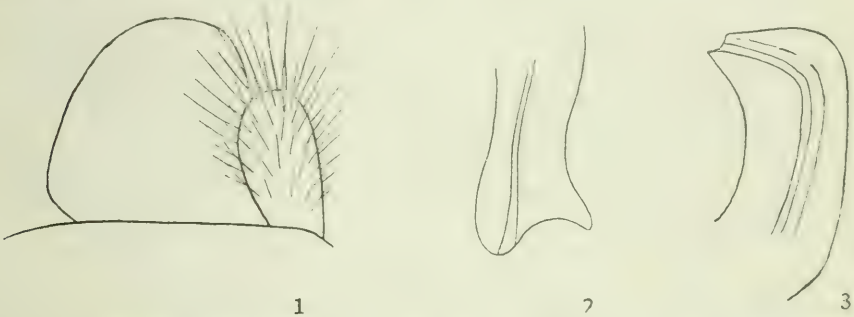
14. *Parajulus pennsylvanicus* (Brandt).

Two males taken in Jan.

15. **Parajulus annectans,** new species.

Closely related to *P. nigrans* Chamberlin, described from near Nashville, which it much resembles in its small size, though more slender, and in its dark coloration. The dorsum above the repugnatorial pores, however, is lighter, having a reddish tinge, and is marked with a median longitudinal dark line.

In the original description of *nigrans* the anal tergite is said not to exceed the valves, but reexamination shows this to be due to the fact that the valves are not fully closed. In the present species the anal tergite is acutely produced well beyond the valves, the mucro straight.



1 2 3

Fig. 1.—1. *Parajulus annectans* sp. n. Anterior gonopod of left side, ectal view, x72. 2. Tip of telopodite of right posterior gonopod, ectal view, x115. 3. *Parajulus nigrans* Chamb. Tip of telopodite of left posterior gonopod, ectal view, x115.

The two species are clearly distinct in the structure of the gonopods of male, although in this closer to each other than to any other known species. In *annectans* the posterior division of the anterior gonopods is broader and shorter relatively to the anterior division, distally broadly rounded, not distally narrowed and bent in mesad. The principal blade of the posterior gonopod is covered in lateral view by the anterior gonopod, whereas in *nigrans* it descends well below the level of the anterior member; distal end in *annectans* with distoventral corner angled and extended ventrad as shown in fig. 1, 2 instead of being rounded as it is in *nigrans*. (See fig. 1, 3). Anterior gonopod as shown in fig. 1, 1. Spine from base of posterior gonopod long and acute, extending ventrad.

Number of segments, forty-eight.

Locality,—Tennessee: Knox Co. One male.

Type,—M.C.Z., No. 5,024.

16. *Spirobolus marginatus* (Say).

Two large specimens taken at Elkmont, el. 3,500 ft., and one at Knoxville.

NEW ENGLAND HEMIPTERA-HETEROPTERA.

New Records. II.[1]

BY H. M. PARSHLEY,

Smith College, Northampton, Mass.

During the four years which have elapsed since the publication of my New England List of Hemiptera-Heteroptera[2] I have made an effort to keep track of all additions to this fauna which have come to light. In 1919 I published

[1] Contributions from the Department of Zoology, Smith College, No. 82.

[2] Occas. Papers of the Boston Society of Natural History. VII. Fauna of New England. 14. List of the Hemiptera-Heteroptera, August, 1917.

a formal supplement,[3] and later some other papers[4] with new data, while several works (cited hereinafter) have appeared, in which new species from our region are described. The examination of various collections has also afforded additional information on our fauna. All the new data thus gathered since the first supplement are collected here, bringing the New England enumeration down to date.

In the original list 419 species were recorded, one of which has since been removed as a synonym.[5] In the first supplement 15 species[6] were added, and in the present paper 39 more, which brings the total number of Heteroptera now known to inhabit New England to 472. It is worthy of note that of these newly recorded members of our fauna 31 are species described since the publication of the original List in August, 1917, especially in revisions of *Aradus* and *Phytocoris*, genera which previously had been little studied, and that the other additions number only 22, or about 5% of the first enumeration.

In the following pages the species given in bold-face type are recorded as additions to the New England fauna, while the others are in almost all cases new to the various State lists. For collectors' names see the original paper.

PENTATOMIDAE

Sciocoris microphthalmus Flor.

ME.—Cumberland County, 1916 (*A. Nicolay*).

Peribalus limbolarius Stal.

ME.—Peaks Island, 3 Aug. '18 (*G. A. Moore*).

Euschistus politus Uhler.

CONN.—Portland, 20 July '19 (*B.H.W.*).

Mineus strigipes (Herrich-Schaeffer).

CONN.—New Canaan, 12 Sept. '18 (*M.P.Z.*).

ARADIDAE.

ARADINAE

Aradus robustus Uhler.

N.H.—Three Mile Island, 27 May, '08 (*F.B.*)

Aradus duzeei Bergroth.

MASS.—Northampton, 17 May '19 (*Dorothy Merchant*).

Aradus proboscideus Walker. (=*A. hubbardi* Heid. of the List.)

N.H.—Mt. Washington, Summit (*A.T.S.*).

Aradus basalis Parshley.

Trans. Am. Ent. Soc., XLVII:54, 1921.

ME.—Holden, 20 June '02 (*F.A.E.*); Mt. Katahdin, 9 Aug. '02 (*H.G.B.*).

N.H.—Mt. Washington, Summit (*A.T.S.*): Temple, 26 May '00 (*F.B.*)

Aradus consors Parshley.

Op. cit., p. 56.

MASS.—(*S.H.*).

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[3] N.E. Hem.-Het. New Records, Can. Ent., LI:70-72, 1919.

[4] Hem. Peaks Island, Maine, Can. Ent., LII:80-87, 1920.
Hem. Western N.E., Psyche, XXVII:139-143, 1920.

[5] *Melanorhopala obscura* Parsh.=*M. clavata* Stal.

[6] *Corythucha pallipes* Parsh, now includes *C. cyrta* Parsh. and *C. betulae* Drake.

Aradus similis Say.

N.H.—Durham, 19 Apr. '06 (*C. S. Spooner*).

Aradus shermani Heidemann.

ME.—Orono, 22 May '14 (*H.M.P.*).

Aradus inornatus Uhler.

ME.—Orono, 1 May '14 (*H.M.P.*).

N.H.—Claremont, June-Oct.; Hanover (*C.M.W.*); Merrimack, 11 May '00 (*F.B.*).

MASS.

Aradus approximatus Parshley.

Op. cit., p 72.

ME.—Mt. Katahdin, 26 Aug. '02 (*H.G.B.*).

Aradus borealis Heidemann.

ME.—Mt. Katahdin, 5215 ft., 19 Aug. '02 (*H.G.B.*).

Aradus insignitus Parshley.

Op. cit., p. 75.

MASS.—(*F. G.Sanborn*).

Aradus abbas Bergroth.

N.H.—Mt. Washington ; Three Mile Island, 23 May '08 (*F.B.*)

Aradus falleni Stal.

R.I.—Providence (*C.A.D.*).

CONN.—New Haven, 18 June '19 (*M.P.Z.*).

Aradus cinnamomeus Panzer.

MASS.

Aradus niger Stal.

ME.—S. W. Harbor, 11 July '18 (*C.W.J.*).

MASS.—Northampton, 8 Oct. '19 (*Ottilie Meiner*); Pelham, 28 Aug. '19 (*H.M.P.*).

MEZIRINAE.

Neuroctenus simplex Uhler.

CONN.—Branford, 6 April '21 (*M.P.Z.*).

NEIDIDAE.

Neides muticus (Say).

VT.—Haystack Mt., 5 Sept. '19 (*H.M.P.*).

LYGAEIDAE.

Geocoris uliginosus (Say).

CONN.—New Haven, 11 July '20 (*B.H.W.*).

Perigenes constrictus (Say).

CONN.—Salem, 12 July '14 (*H.W.F.*).

Zeridoneus costalis (Van Duzee).

Barber has recently proposed[7] the new genus *Zeridoneus* for *Perigenes costalis* (List, page 49). The Boston record pertains to *P. constrictus*.

[7] Concerning Lygaeidae, No. 1, Jour. New York Ent. Soc., XXVII:45, 1918. Synop. Keys Lyg. II., Psyche, XXV:76, 1918.

Ptochiomera clavigera Uhler.

MASS.—Dracut.

CONN.

Pseudocnemodus canadensis (Provancher).

CONN.—Salem, 22 July '14 (*H.W.F.*).

Kolenetrus plenus (Distant).

ME.—Peaks Island, 26 July '18 (*G. A. Moore*).

Stygnocoris rusticus (Fallén).

ME.—Peaks Island, 31 July '18, 8 Aug. '19 (*G. A. Moore*).

Emblethis vicarius Horváth.

MASS.—Northampton, 7 Oct. '20 (*H.M.P.*)

Microtoma atrata (Goeze).

Barber, Concerning Lyg., No. 2, Jour. New York Ent. Soc., XXVI:61,'18.

R.I.—(Uhler collection; locality possibly incorrect).

TINGIDAE.

Stephanitis pyrioides (Scott).

CONN.—New Canaan, 20 Sept. '19 (*P. Garman*).

Corythucha pyriformis Parshley.

Can. Ent., LII:81, 1920.

ME.—Peaks Island, 31 July '19 (*G. A. Moore*).

N.H.—Franconia (*A.T.S.*).

Corythucha heidemanni Drake.

VT.—Woodford, 5 Sept. '19 (*H.M.P.*)

Corythucha ulmi Osborn and Drake.

N.H.—Durham (*C.M.W. and W.F.F.*),

Corythucha mollicula Osborn and Drake. (=*C. salicis* O.&D., List, p. 119.)

Drake, Notes Am. Ting., Florida Ent., March, 1921, p. 53.

ME.—Orono, 16 July '06.

Leptoypha mutica (Say).

MASS.—Lexington, 25 June '20 (*G. W. Barber*).

Physatocheila brevirostris Osborn and Drake.

CONN.—New Haven, 5 July '20 (*B.H.W.*).

Alvcotingis grossocerata Osborn and Drake.

CONN.—New Haven, 5 July '20 (*B.H.W.*)

NABIDAE.

Nabis sordidus Reuter.

CONN.—Guilford, 13 July '20 (*B.H.W.*)

Nabis roseipennis Reuter.

VT.—Haystack Mt., Sept. '19 (*H.M.P.*).

Metatropiphorus belfragii Reuter.

CONN.—Pleasant Valley, Litchfield Co., 1 Aug. '15 (*G.P.E.*)

ANTHOCORIDAE.

Tetraphleps americana Parshley.

Can. Ent., LII:84, 1920.

Me.—Peaks Island, 3 Aug. '19 (*C. A. Moore*).

Tetraphleps uniformis Parshley.

Op. cit., p. 85.

N.H.—Mt. Washington (*A.T.S.*).

MIRIDAE

Phytocoris pallidicornis Reuter.[8]

VT.—Haystack Mt., 5 Sept. '19 (*H.M.P.*).

Phytocoris eximius Reuter.

Knight, Bull. Brooklyn Ent. Soc., XV:51, 1920.

ME.—Casco Bay, 27 Sept. (*G.P.E.*).

MASS.—Northampton, 27 Sept. '18 (*H.M.P.*).

Phytocoris neglectus Knight.

Op. cit., p. 54.

ME.—N.E. Harbor, 26 July (*C.W.J.*).

MASS.—Boston, 13 Oct. '15 (*H.M.P.*), and nearby stations; Woods Hole, 15 July-6 Aug. (*C.E.O.*).

Phytocoris onustus Van Duzee.

Proc. Calif. Ac. Sci., (4) IX:344, 1920.

Knight, *Op. cit.*, p. 54.

ME.—Machias, 22 July '09 (*C.W.J.*); Mt. Katahdin, 650 ft., 22 Aug. '13 (*C.P.A.*).

N.H.—Glen House, 24 July '15 (*C.W.J.*)

VT.—Haystack Mt., 5 Sept. '19 (*H.M.P.*) (Det. ? by Knight).

Phytocoris spicatus Knight.

Op. cit., p. 55.

ME.—Machias, 19 July '09 (*C.W.J.*).

MASS.—Lunenburg, 15 July '16 (*H. W. Allen*).

Phytocoris cortitectus Knight.

Op. cit., p. 55.

N.H.—Glen House, 24 July '15 (*C.W.J.*).

Phytocoris salicis Knight.

ME.—Machias, 26 July '15 (*C.W.J.*).

N.H.—Hanover, 3 July '15 (*C.W.J.*).

MASS.—Beach Bluff, 11 Aug. '15 (*H.M.P.*); Lunenburg, 22 July '16 (*H. W. Allen*); Sunderland, Mt. Toby, 6 July '18 (*H.M.P.*); Woods Hole, 6 Aug. (*C.E.O.*).

CONN.—Branford, 15 July (*H.W.W.*).

Phytocoris buenoi Knight.

Op. cit., p. 57.

MASS.—Marblehead, 24 July '14 (*H.M.P.*); Woods Hole, 6 Aug. (*C.E.O.*).

CONN.—New Haven, 27 June (*W.E.B.*)

Phytocoris erectus Van Duzee.

Proc. Calif. Ac. Sci., (4) IX:345, 1920.

Knight, *Op. cit.*, p. 57.

[8] This species and *P. onustus* Van Duzee, ♀, (?) are incorrectly recorded as *P. lasiomerus* and *P. eximius* on page 142 of the second paper cited on p. 234, foot note 4, through a clerical oversight.

ME.—Ft. Kent, 19 Aug., '10 (*C.W.J.*); Penobscot Co., 1 Aug., '10 (*J.A.C.*)
N.H.—Crawfords, 28 Sept. '16 (*H.M.P.*).
MASS.—Brookline, 25 Sept. (*C.W.J.*); Chester, 3 Aug., '12 (*C.W.J.*); Plymouth, 28 July (*C.W.J.*).

Phytocoris penipecten Knight.

Op. cit., p. 58 (*P. penipectus, laps. cal.*)
MASS.—Amherst.
CONN.—East River (*C.R.E.*); New Britain, Sept. (*W.E.B.*).

Phytocoris fulvus Knight.

Op. cit., p. 59.
ME.—Peaks Island, 31 July '18 (*G. A. Moore*).

Phytocoris conspersipes subsp. **diversus** Knight.

Op. cit., p. 60.
ME.—Liberty, 16 Sept. '13 (*J.A.C.*).
N.H.—Franconia (*A.T.S.*).
MASS.—Northampton, 1 Oct. '20 (*H.M.P.*).

Phytocoris quercicola Knight.

Op. cit., p. 60.
MASS.—Beach Bluff, 27 Aug. '14 (*H.M.P.*).

Phytocoris conspurcatus Knight.

Op. cit., p. 61.
MASS.—Beach Bluff, 24 Aug. '16 (*H.M.P.*), at light; Boston, 9 Aug. (*H.M.P.*)
CONN.—Hartford, 12 Sept. (*W.E.B.*); Wallingford, 3 Aug. '12 (*D.J.C.*).

Phytocoris corticevivens Knight.

Op. cit., p. 63.
ME.—Orono, July '12.
CONN.—Lyme, 4 July (*H.B.K.*); New Haven, 20 June '11 (*A.B.C.*)

Phytocoris sulcatus Knight.

Op. cit., p. 64.
MASS.—Boston, 20 July (*H.M.P.*).
CONN.—Branford, 22 Aug. (*H.W.W.*).

Phytocoris tibialis Reuter.

ME.—Peaks Island, 3 Aug. '19 (*C. A. Moore*).

Paracalocoris hawleyi var. *ancora* Knight and var. *pallidulus* McAtee.

Ann. Ent. Soc. Amer., IX:378, 1916.
MASS.—Sunderland, Mt. Toby, 6 July '18(*H.M.P.*)

Lygus apicalis Fieber.

MASS.—Edgartown, 22 Aug. '12 (*C.W.J.*); Provincetown, 8 Sept. '90.

Camptobrochis borealis Van Duzee.

Proc. Calif. Ac. Sci. (4) IX:354, 1920.
ME.—Portland, 4 July '09 (*E.P.V.D.*).

Alepidia gracilis (Uhler).

MASS.—Arlington, 30 July '20 (*G. W. Barber*).

Orthocephalus mutabilis (Fallén).

ME.—Southwest Harbor, 14 July '18 (*C.W.J.*).

Macrotylus sexguttatus (Provancher).

Mass.—Lexington, 25 June '20 (*G. W. Barber*).

GERRIDAE.

Gerris marginatus Say.

Vt.—Woodford, 5 Sept. '19 (*H.M.P.*).

Rheumatobates rileyi Bergroth.

Mass.—Northampton, 22 Aug. '19 (*H.M.P.*).

Vt.—Woodford, 5 Sept. '19 (*H.M.P.*).

VELIIDAE.

Microvelia buenoi Drake.

Bull. Brooklyn Ent. Soc., XV:20, 1920.

Me.—Orono, 3 May '14 (*H.M.P.*).

Mass.—Northampton, 22 April '21 (*H.M.P.*); Saugus, 27 August '17 (*H.M.P.*).

This minute species, recently described from the Adirondacks, has just been found in large numbers in a small campus pond, where no Microvelia has previously occurred. Nymphal and adult stages were present. It may be readily distinguished from the equally small *M. borealis* Torre-Bueno by its shorter and thicker third antennal segment, which is clavate, not linear, the straight posterior tibiae in the male, and the conspicuous tufts of long silvery pubescence which ornament the abdomen in the apterous form. The Maine record in the List, page 108, pertains to *M. buenoi,* not to *M. borealis,* according to material now in my collection.

Microvelia hinei Drake.

Ohio Jour. Sci. XX:207, 1920.

Mass.—Northampton, 22 June '21, 3 Oct. '21 (*H.M.P.*).

In antennal structure this species resembles the preceding, but it is still smaller, shows little sexual dimorphism, and in the apterous condition is very brightly colored, though without dorsal silvery pubescence on the abdomen.

Microvelia albonotata Champion.

Mass.—Northampton 22 June '21 (*H.M.P.*).

HEBRIDAE.

Hebrus burmeisteri Lethierry & Severin.

Mass.—Northampton, 22 June '21 (*H.M.P.*).

I am not certain of the proper application of the names, *H. burmeisteri* and *H. concinnus* Uhl., and they may be synonymous as the published distribution would seem to indicate ; or it is possible that *concinnus* is in reality a West Indian species, distinct from the one common in the eastern United States. At any rate I have found but one form in the latter region.

Merragata foveata Drake.

Ohio Jour. Sci., XVII:103, 1917.

Mass.—Sunderland, Mt. Toby, 28 May '21 (*Priscilla Butler*).

BELOSTOMATIDAE.

Lethocerus americanus (Leidy).

Mass.—Northampton, 7 Oct. '19 (*H.M.P.*).

Covered with a bright green alga, which changed to gray in drying.

Lethocerus obscurus (Dufour).

Mass.—Northampton, 26 Sept. '19 (*H.M.P.*).

OBITUARY.

F. W. L. Sladen.

Canadian Entomologists were shocked to learn of the accidental death by drowning of Mr. F. W. L. Sladen, Dominion Apiarist, which occurred off Duck Island in Lake Ontario on September 10th, 1921.

For several years he had been conducting important experiments in the rearing of bees. On August last he left Ottawa for the above island, which is about 20 miles distant from Kingston, Ont. He had been in the habit of bathing in the shallow water close to the shore; unfortunately he could not swim. On the above date he went in bathing as usual and it is assumed that his heart, which had troubled him for several years, failed to function, thus causing his death. The body, which was recovered about seventy feet from the shore, was partially floating, unswollen, and no water was found in the lungs.

In the death of Mr. Sladen, entomology in Canada loses a very careful worker. Other than the reputation he had gained as a successful apiarist and student of bee rearing, he was well known in Canada, as also in the United States and England, as a close, systematic student of the aculeate hymenoptera. He had a wide knowledge of the wild bees, and his writings indicate a careful taxonomic acquaintance with the various characters of the groups he studied.

The collections he brought together not only indicate keen powers of observation, but also the intense pleasure he derived in gathering series of interesting species collected while afield in various parts of Canada, particularly in the West.

The late Mr. Sladen came to Canada in 1912 to join the staff of the old Division of Entomology, as Assistant Entomologist for Apiculture. When the Division of Entomology was separated from the Experimental Farms Branch in 1914 and raised to the status of a Branch of the Department of Agriculture, Mr. Sladen was retained by the Experimental Farms Branch as Apiarist. More recently his title was changed to Dominion Apiarist. Since 1914, however, he has always had a close connection with the Entomological Branch, having been, in fact, largely responsible for the identification and arrangement of the aculeate hymenoptera in the National Collection of Insects.

He was a Fellow of the Entomological Society of London, member of the Entomological Society of America, Entomological Society of Ontario, Ottawa Field-Naturalists' Club, etc.

As an author he was best known as the writer of "Queen Rearing in England" and "The Humble Bee," both excellent treatises. He was a frequent contributor of the Canadian Entomologist, Canadian Field Naturalist and other scientific journals. One of his most recent papers was the report he prepared on the Wasps and Bees collected by members of the Canadian Arctic Expedition of 1913-1918.

Arthur Gibson.

Mailed February 3, 1922.

The Canadian Entomologist

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POPULAR AND PRACTICAL ENTOMOLOGY

THE LIFE HISTORY OF A HOBBY HORSE

BY FRANCIS J A. MORRIS,
Peterborough, Ont.

PART III.—SECOND CHILDHOOD—THE TREE'S INCLINE.

(Continued from Page 221)

So long as they held the middle space I had thought them a pair of ospreys, but presently, when they had already reached the greatest height I have ever seen these fish hawks flying at, one of the birds rose leisurely up in spiral upon spiral till it appeared little bigger than a skylark " at the last point of vision"; then down it shot in that fearful dive so closely past the outspread form of its floating mate that she seemed to rock where she slept: "she," for I am almost certain it was the male that made this supreme plunge from empyrean heights; the other, more passive, maintained the middle space, only now and then stooping, in turn, directly over him, or sweeping aslant with a downward glide to meet him in the common highway of the lesser fowls before he had fully recovered and soared once again into the unchallenged void of his eagle's realm. For nearly an hour from the little row-boat in which I was fishing I watched this royal pair at play.

At the end of August, there used to be a great routing out of guns, cleaning and oiling, ready for Black Duck; then came Wood-duck and Teal both the Blue- and the Green-winged, and later still Blue-bills, Saw-bills, Whistlers and several others. The only bird guide available in those days was McIlwraith's "Birds of Ontario," and I remember hours of puzzling one evening over a couple of strangers in the day's bag, that turned out to be two distinct species of Scoter, a surf duck from the Atlantic coast seldom seen in the neighborhood. And once my pupil returned from near the Mississippi Lake with a Cormorant that had fallen to some lucky gun.

These hunting trips were often the means of enriching our knowledge of Nature by curious observations. One day when my pupil and two others had carefully ensconced themselves in a lonely piece of swamp, each at a different station and in good time for the incoming ducks at sundown, they discovered to their surprise a fourth sportsman had anticipated their calculations and slipped into a "hide" in front of them. All three were watching the first black duck of the evening come whirring towards them, and not yet certain which of the three the duck would select to pass over, when suddenly a large hawk rose from ambush before their eyes, clutched the duck from below, and drew it down again out of sight in the drowned lands. The whole thing was done in a second and apparently with consummate ease; it looked as simple as the movements of a gymnast where the art of concealing art blinds one to all the nicety of adjustment, the hair's breadth balance of time and

space; only those who know the weight of a black duck and the terrific speed of its flight across a danger zone in mid-September, when plunging towards its nightly roost, can have the slightest idea of what this piece of falconry meant.

The tables were turned when one of these "duck hawks" suddenly seized a wooden decoy we had put out in a small bay and tried to drag it from its moorings. The savage anger of its blows with the beak and repeated clutchings of claw, made a deeper impression on us than they did on the perfidious piece of basswood itself; though this too showed plainly by dint and score where mandibles had glanced and talons slipped in their stroke.

I remember one day when my pupil and I went up the lake with a batch of decoys in search of wood duck and teal. On the way up I landed a couple of bass with a trolling rod, and then we drew our boats into cover of the reeds and entered the "hide". We hadn't been there many minutes when we heard a scrambling sound from my boat, and I was just in time to see a mink drop one of the bass over the gunwale and make off through the cat-tails on "safety first" principles. They are astonishingly bold and will steal bait from a minnow pail almost under one's nose. While waiting patiently in the hide, we heard the whistling of wings as from an approaching flock of wood duck. But nothing appeared and the sound lasted on and on without perceptibly waxing or waning; I could make nothing of it; it might have been a phantom flock tethered in a nightmare, beating the air but making no progress. My companion's ears were better trained than mine and he soon solved the riddle; a vast phalanx of wild geese strung across the sky on their southward march, with leaders and outriders all in order; they appeared almost as specks so high were they flying, yet the sound was plainly audible for many minutes.

In 1899, the year before I settled in Port Hope, it was my good fortune to spend spring and early summer in Toronto. My best finds were botanical, and the only bird record I made was very early in May towards the west of High Park. I had just discovered a great colony of Skunk Cabbage in a small willow swamp, when almost over my head I heard some full sweet tones of bird music; they came from a nearby poplar just leafing out, and by tip-toeing cautiously up I was able to spy the singer and watch him through his song,. As soon as I described the bird to Dr. Brodie he proclaimed it the Rose-breasted Grosbeak. I had never seen or heard of it before, and though I often saw it afterwards at Port Hope, I never heard it in full song until I came to Peterborough; now, whenever I hear it, I am carried back in spirit to High Park and the revelation of twenty years ago. The plant treasures were far more numerous, and so interesting as to fill the whole season with delightful surprises; east of the city I discovered the little Rue Anemone, which Dr. Brodie assured me he had never found except west of Toronto; up north I found the handsome Orange Lily and the nodding heads of the Woodlily; the Turk's Cap, also, I found at Scarborough Heights; in Rosedale, too, I first found the "wooden enemies" of my Scottish home (*Anemone nemorosa*), the most delicate and charming of all their kind—the true "wind-flower;" to the west I found the lovely blue Lupine, the Orange Milkweed, the Beard-tongue, the Feverwort and the Painted Cup. By the following April I had settled in Port Hope.

That Natural History takes firmer hold in a community of boys than anywhere else, was amply borne out at my new home of Trinity College School. For years its Head Master had been Dr. Bethune, an entomologist of continental reputation. Though athletics held a high place of esteem, there was always an awkward squad of a minority poor at games and forming a kind of Stalkey & Co. in the school. Such boys have often a natural trend in the direction of birds' nesting; and there had always been a good deal of surreptitious egg-collecting done by the pupils; this was "taboo" among the masters, and in order to make the ban effective, some wise-head of earlier days had instituted an annual prize for wild flowers; a rule of the competition was that each collection of plants must be the work of two boys in partnership. This incentive of a prize largely explains why there were usually at least four or five pairs of partners working quite enthusiastically through the summer term at their collecting, mounting, and naming of specimens. Almost as soon as I joined the staff my room became the resort of the plant collectors, and when they organized into a Field Club, they asked me to be their Honorary President.

My first two seasons were spent in active pursuit of Botany and Ornithology. I had cleared the way, I thought, enough to run both hobbies concurrently. It was now that I began to fill two shelves with books on Natural History, one devoted to plants and the other to birds, the nucleus of a whole case now numbering some 400 volumes. I never felt quite the same need of books, for purposes of identification, in Botany as in Birds. When I came to the school first I had nothing on Ornithology but a copy of McIllwraith; besides that, I knew of a periodic publication called "Birds", afterwards "Birds and All Nature". But almost coincident with my settling in Port Hope there began to appear a number of popular books, with colored illustrations, on various branches of Natural History. The pictures were nearly all photographic by the three-colour process. My first purchase was Chapman's Bird Life and this was followed by the volumes of Neltje Blanchan on "Bird Neighbors" and "Birds that Hunt and are Hunted", Dugmore's "Bird Homes", Chester Reed's "Color Key to North American Birds" and "Key to the North American Birds' Eggs;" more recently still were added the invaluable little pocket books of bird pictures, description and classification; besides these I purchased (on a hint from one of John Burroughs' essays) a pair of field glasses, and always carried notebook and pencil to the woods with me; in this way I formed the habit of complex observations, attempting to jot down the syllables of a bird's song or to describe it in words, to watch its coloring in different parts, wings, tail, body, head, throat and breast, its perch and manner of flight, and generally its habits; my first volumes on Birds were too large to carry to the woods, but on returning to my study I always made a bee line for the book shelf. At first my trips were primarily botanical and only included bird notes on the side. But I made a number of most interesting observations, and in my almost daily excursions saw a great many out of the way birds and bird homes. I never took an egg, even the rarest, and never (I am happy to add) had the slightest desire to.

While busy with bird observations, I found it a great pleasure to note the birds seen in the winter and the early spring arrivals till the flights of warblers. Among the birds that I saw occasionally all winter were robins; these appeared

to go into winter quarters in thickets of cedar about the golf links, and in mild Decembers and Januaries I have often seen them hopping about in the open; two mild years I saw Kingfishers on the running water below Corbett's pond and noted them every month from October to April; one more proof that it is want of food, not cold, that drives them south; I have also seen Meadow Larks in December. Among regular winter residents (besides Chickadees and Wrens) were noted Snow-birds, Horned Larks, Siskins, Goldfinches, Purple Finches, Red-polls, Wax-wings, Pine Grosbeaks and the Evening Grosbeak. In spring, favorites were the Ruby- and Golden-Crowned Kinglets, the American Redstart, the Black and White Warbler, the Blackburnian, the Chestnut-sided, the Bay-breasted, the Canadian and the Black-throated Blue Warblers.

A season or two's rambling about the neighborhood soon led to the selection of some five favorite haunts for my leisure hours:—Monkey Mountain on the outskirts of the town; Choate's Wood, the North Wood and "The Rocky Mountains", all three in line for a single round trip; and last the Newtonville swamp about ten miles west. At Monkey Mountain I discovered a favorite haunt of the Brown Thrasher, and spent hours listening to its masterful music. It was here, too, that I first discovered (to my surprise) the double personality of the Chickadee; the bird I was watching at its trapeze work suddenly passing from the familiar scolding prattle to a soft deliciously sweet and plaintive "Tee-hee"; different from the Phoebe's cry, which is not nearly so musical nor plaintive at all. The most attractive of all the Flycatcher calls in my experience is the Olive-sided Flycatcher's "Whip-whee-eu", loud, clear, and commanding, but no way harsh (the common fault of the Flycatchers); next to it I place the Crested Flycatcher's, more imperious and slightly harsh, but not to the point of disagreeable. The Crested Flycatcher is quite common about Port Hope and once I had a curious experience. I was working in my room about supper time when there came to my door a shuffling of feet and then a hesitating knock. In came two boys who explained that they wanted to show me something, if I would promise not to forfeit it; they had been bird's nesting and had found a strange egg in a nest built over an old Highholder's in a hollow apple tree. Reference to Chester Reed's book soon brought the discovery that it was a Crested Flycatcher's. Knowing the peculiar instinct of this bird to weave a snake's skin into its building material I asked the boys if they had noticed anything peculiar about the nest. They hadn't, but would go and look carefully over it next day; on their coming to report I was to tell them the name of the egg. In they came, full of excitement, with what, do you suppose, in their hands? Not the slough of a snake, but a mighty good substitute they had found in the material of the nest—five or six crumpled pieces of oil-paper candy-wrappers! John Burroughs records having seen onion-peel and the scales of shadfish in their nests where the birds had failed to find snake skins. It seems possible, too, that the Flycatcher does his own fishing for shad; not long ago a Flycatcher was seen, by a good observer, to play the Kingfisher and pick a live shad out of the water, on the shore of Lake Ontario. This curious habit of the Crested Flycatcher is apparently inherited from tropical ancestors and is shared with it (so I have read) by one of the common Flycatchers of Brazil.

The whole course of my round from Choate's to the North Wood and "The Rockies" was soon dotted with discoveries. Near Mitchell's Gardens I

saw my first Orchard Oriole; and a few rods further on, the larder of a Northern Shrike; the bird was fluttering at the top of a barb wire fence and on my approach flew heavily away with what looked like a sparrow; on examining the fence I found the two top strands of wire, all the way along between two posts, had been used for killing and hanging the butcher's meat, the barbs having remains of beetles, birds and mice smeared about them.

(To be Continued.)

ON SOME ARACHNIDS FROM SOUTHERN UTAH

BY RALPH V. CHAMBERLIN,
Cambridge, Mass.

In a small collection of spiders and scorpions from St. George, Utah, sent me for identification, are representatives of two new species which are here described. The other species in the lot are also listed. The material was collected by Mr. V. L. Tanner.

ARANEINA.

Dictyna volucripes Keyserling.

One female of this widespread species, which is common in central and northern Utah.

Psilochorus utahensis Chamberlin.

One female apparently this species, which is common in Millard Co., from where described.

Physocyclus tanneri, sp. nov.

Female.—As compared with *P. globosus* Tacz. this is a larger species with much longer and stouter legs. It may at once be distinguished by lacking the caudal process at caudal end of cephalothorax and the opposing chitinous spot on abdomen which are characteristic of *globosus*. The abdomen is obviously less elevated and more flattened above, and in front protrudes farther over the cephalothorax; its anterior end somewhat bigibbous (cf. fig. 1.) The epigynum has the anterior processes larger as compared with the posterior portion and much more widely separated, posterior portion less protuberant; the fold just back of genital furrow stronger, on a level with contiguous part of epigynum, dark and chitinous. The epigynum more resembling that of *P. cornutus* of Lower California. Cf. Plate X, figs. 2, 3, 4 and 5.

Length 4.5 mm.; length of leg, 1.33 mm.

Two females.

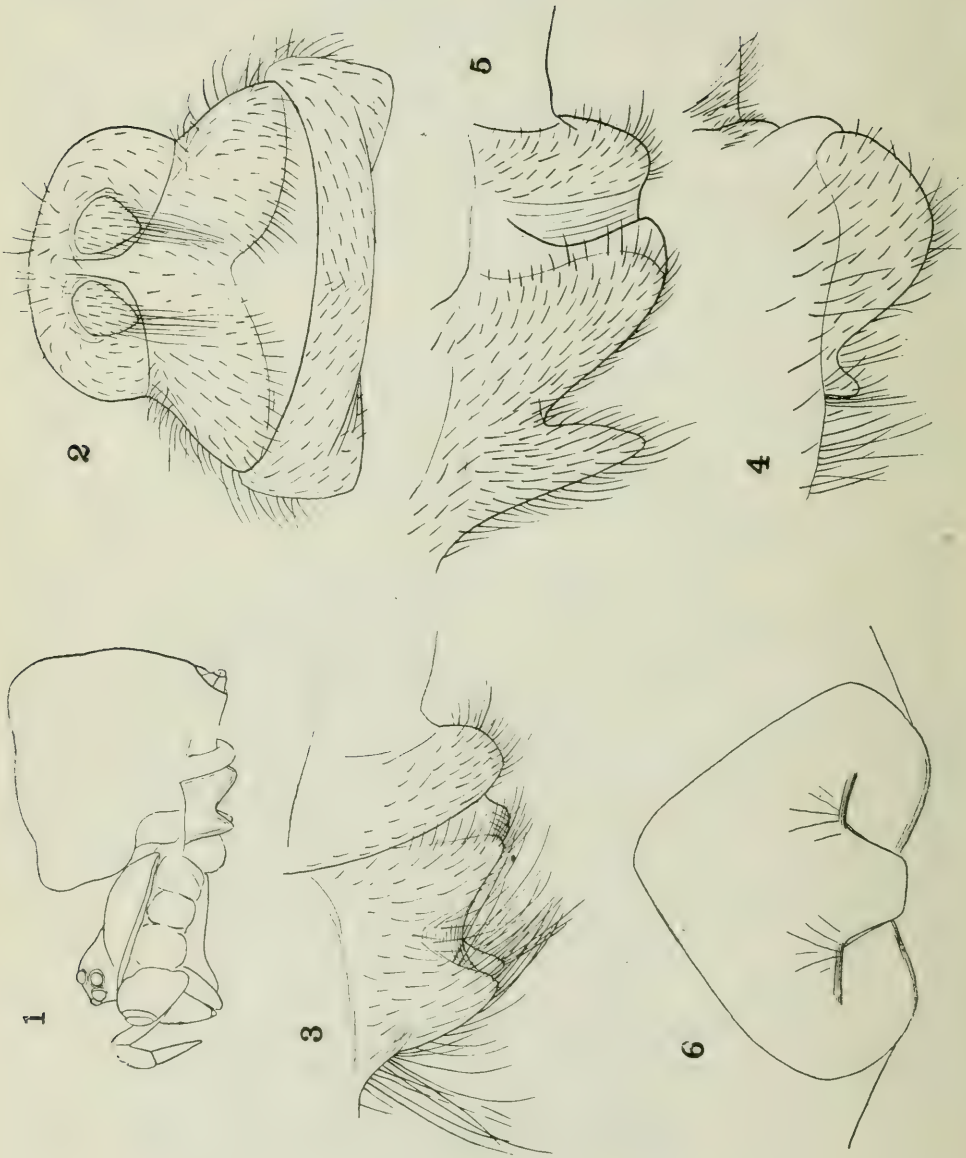
Philodromus virescens Thorell.

Philodromus clarus Keyserling, Die Spinnen Amerika, 1880, I, p. 214.

One male of this form, which is common farther north on sage-brush.

Philodromus utus, sp. nov.

In alcohol the carapace is greyish fulvous, with a lighter greyish median longitudinal stripe more or less evident. Legs colored similarly to carapace. Abdomen grey, without distinct markings. Venter pale. Posterior median eyes a little more than twice their diameter apart, about half as far from the laterals, or a little more. Anterior lateral eyes nearer to the posterior medians than to the posterior laterals. Tibiae I and II with three pairs of long, overlapping spines beneath. Spines of metatarsi I and II similarly three pairs be-



ARACHNIDS FROM S. UTAH.

(See Page 247)

neath and overlapping. Abdomen depressed, somewhat bigibbous in front. Characterized more particularly by the form of the epigynum. (cf. Plate X, fig. 6.).

Length, 5 mm.

Several females.

Tibellus duttonii Hentz.

One female apparently this species.

Olios fasciculatus Simon.

Two females.

Pardosa sternalis Thorell.

Several females and males. This is one of he commonest spiders found in the intermountain region.

Lycosa apicata Banks.

One male. The species has not previously been taken in the region.

Oxyopes salticus Hentz.

One female.

Phidippus workmanii Peckham.

Three females.

Phidippus formosus Peckham.

One female.

Salticus albocinctus Peckham.

A male and female. Previously known from Arizona and Mexico.

Eurypelma steindachneri (Ausserer).

One female.

SCORPIONIDA.

Hadrurus hirsutus (Wood).

One specimen of this large form.

Velovis mexicanus (Koch).

One specimen.

EXPLANATION OF PLATE X.

Fig. 1.—*Physocyclus tanneri*, sp. n., lateral view of body. x 10. 2.—The same, epigynum, ventral view. x 33. 3.—The same, ectal view of epigynum. x 33. 4.—*Physocyclus globosus* Tacz., epigynum, ectal view. x 33. 5.—*Physocyclus cornutus* Bks., epigynum, ectal view. x 33. 6.—*Philodromus utus*, sp. n., epigynum, ventral view. x 38.

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID GENUS ERNESTIA R. D. (DIPTERA)

BY DR. JOHN D. TOTHILL

In Charge of Natural Control Investigations, Entomological Branch, Ottawa.

(Continued from Page 230)

Ernestia nigropalpis sp. n.

Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground with black hairs coming nearly up to the

eyes and with a row of stouter hairs at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment and equal to about one-third the distance between the vibrissae. Facial ridges bristly on lowest fifth. Facial depression silvery pollinose, without any carina. Antenna in male reaching lowest three-fourths of the face, all three segments black; third segment in male almost twice as long as the second. Arista thickened on basal two-fifths; the penultimate segment no longer than broad; width of front in male at narrowest point measuring slightly less than the length of the second antennal segment, silvery pollinose becoming black at vertex; frontal vitta dull, dark-brown, at narrowest point slightly wider than either side of front. No orbital bristles in male; the frontal bristles extending to base of third antennal segment. Ocellar bristles present in male, directed forward.

Thorax subshining, black, covered with grey pollen; scutellum grey pollinose on a black ground tinged faintly reddish at apex. Three sternopleural bristles and three to four post suturals; scutellum with three marginal pairs of machrochaetae and a terminal cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of three to five bristles at the base on both the upper and lower surface. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal bristles present on the second, third and fourth abdominal segments; a pair of median marginal machrochaetae also present on each of these segments. The fifth tergum very narrow and rather indistinctly marked off by a suture from the sixth tergum with which it is united. Sixth abdominal segment almost as long as the fourth and forming a conspicuous genital segment.

The black genitalia of the male are characterized by there being a short median keel situated on the basal part of the inner forceps (valvae internae), and by the fact that this keel is not concave in profile on either of its two margins.

The horseshoe-like indenture of the fifth sternite extends rather less than half way into the sternite.

Described from eleven males taken at Franconia N.H., Stickeen River, B. C. (type locality), and Savary Island, B. C., by Messrs. C. H. T. Townsend, Wickham and R. S. Sherman.

Type in the Canadian National Collection, Ottawa. The paratype, No. 24354, from Franconia in the U. S. N. M., Washington, D.C.

Ernestia arcuata sp. n.

Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi usually yellow at the tip and infuscated basally, occasionally black. Eyes hairy, cheeks (below the eyes) white pollinose on a black ground, subshining on the lower part that is covered with black hairs, a row of stouter hairs at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width in male slightly less than the length of

the second antennal segment and equal to about two-fifths the distance between the vibrissae. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose, without any carina. Antennae in male reaching the lowest fourth of the face, all three segments black; third segment in male about one and one-half times as long as the second. Arista thickened on basal two-fifths to one-half, the penultimate segment scarcely longer than broad. Width of front in male at narrowest point measuring slightly less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark brown, at narrowest point—in male—slightly wider than either side of front just cephalad of the ocellar triangle. No orbital bristles in male, the proclinate ocellars somewhat weak and reduced in cases to mere hairs; the single row of frontal bristles decending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground in most specimens tinged reddish, especially at the apex. Typically three sternopleural bristles but considerable variation noticeable in the type material; typically four dorsocentral bristles, but these likewise vary considerably in the type material; scutellum with three marginal pairs of machrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3}. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground that occasionally becomes reddish, particularly on the lateral parts of the first three segments. Discal machrochaetae present on the second, third and fourth abdominal segments; median marginals present on the same segments. The hind margin of the third tergum strongly arcuate. The fifth tergum distinctly marked off by a suture from the sixth or first genital segment and laterally being a third as long as the lateral part of the fourth abdominal segment. The sixth and seventh abdominal segments forming somewhat distended genital segments.

Male genitalia black. The basal part of the outer forceps is expanded into a broad, leaf-like portion. The basal part of the inner forceps is equipped with a short median, keel-like projection, the basal edge of which is concave in profile.

The horseshoe-like indenture extends rather more than half way to the base of the fifth sternite.

Described from ten males taken at Great Falls, Va., (type locality), Mount Vernon, Va., Cabin John Bridge, Maryland, Bladensburg, Md., Plummers Island, Md., Hartford, Conn., Malden, Mass., and North Saugus, Mass. Material collected in April and May.

Type No. 24355 in the U. S. N. M., Washington, D.C. A paratype in the National Collection at Ottawa.

Ernestia incisa sp. n.

Description of male. Head at vibrissae nearly as thick as at base of antennae, vibrissae far above the oral margin. Palpi in the single type speci-

men black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower part that is covered with black hairs, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to the base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width equal to the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments black; third segment about one and one-half times as long as the second. Arista thickened on basal two-fifths, the penultimate section scarcely longer than broad. Width of front at narrowest point measuring slightly greater than the length of the second antennal segment, the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point slightly wider than either side of front just cephalad of the ocellar triangle. No orbital bristles, the ocellars proclinate; the single row of frontal bristles extending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that is very slightly reddened at the apex. Three sternopleural bristles and four pairs of dorso-centrals. Scutellum with three pairs of marginal macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle; the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of five to ten hairs both above and below at the junction with R_{2+3}. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and median marginal macrochaetae on segments two, three and four. The hind margin of the third tergum slightly arcuate. The fifth tergum which is pollinose, clearly marked off from the sixth which is shining; the fifth tergum is at its greatest length about one-fifth the length of the lateral part of the fourth. The sixth and seventh abdominal segments form the somewhat distended genital segments.

Male genitalia black. The basal part of the outer forceps is expanded into a broad, leaf-like portion. The basal part of the inner forceps is equipped with a short median, keel-like projection, the basal edge of which is very slightly concave in profile.

The horseshoe-like indenture extends a little less than half way to the base of the fifth sternite. The outer edges of the prongs are deeply incised, thus affording a character that serves to separate the species from any other North American species.

Described from a single male taken at Carlisle Junction, Pa., by W. R. Walton.

Type No. 24356 in the U. S. National Museum, Washington, D. C.

Ernestia aldrichi Town.

Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi dusky yellow to almost black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on

the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height; sides of face covered with silvery pollen; bare; narrowest width not quite equal to the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of face, all three segments black; third segment about one and one-fourth times as long as the second. Arista thickened on basal two-fifths to one-half, the penultimate segment slightly longer than broad. Width of front in both sexes about twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point one and one-half to twice as wide as either side of front just cephalad of the ocellar triangle. One pair of orbital bristles in the male, two pairs in the female. Ocellar bristles present in both sexes and proclinate, the single row of frontal bristles descending almost to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground. Typically three sternopleural and four dorsocentral macrochaetae but both sets are quite variable; scutellum usually with three pairs of marginal and one pair of cruciate apical bristles. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on outer side. Wings hyaline. R_{1+2} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3}. Bend of M_{1+2} with a very short appendage in a few of the males, otherwise destitute of an appendage. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third tergite somewhat arcuate in the male. The fifth tergum in the male marked off from the shining sixth by a suture, longer laterally than medially, laterally about one-fifth the length of the lateral part of the fourth tergum. The sixth and seventh abdominal segments in the male forming the somewhat prominent genital segments.

Genital segments of the male black. The basal part of the outer forceps covered by a leaflike expansion. The basal part of the inner forceps with a long median, keel-like projection.

The indenture in the last sternite of the male extending half the distance toward the base of the sternite.

Redescribed from the type material consisting of three males and four females, from Brookings, S. D., in the U. S. N. M., Washington, D. C. One paratype transferred by courtesy of the collector, Dr. J. M. Aldrich, to the Canadian National Collection, Ottawa.

Ernestia longicarina sp. n.

Description of male. Head at vibrissae almost as thick as at base of antennae; vibrissae far above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) pale golden pollinose on a black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from oral margin to base of eye equal to about one-third the eye height. Sides of face pale golden pollinose; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial

depression pale golden pollinose without any carina. Antennae reaching lowest fourth of face, all three segments black; the third segment about one and one-fourth times as long as the second. Arista thickened on basal half, the penultimate segment scarcely longer than broad. Width of front at narrowest point equal to about three-fourths the length of the second antennal segment; the front silvery pollinose; frontal vitta reddish brown, the narrowest width equal to about one-half the width of front at vertex. No orbital bristles, the proclinate ocellar bristles fairly well developed; the single row of frontal bristles descending to about the middle of the second antennal segment.

Thorax subshining, black, covered with gray pollen, scutellum gray pollinose on a black ground and showing no red coloration even at the extreme tip. Typically three sternopleural bristles and three pairs of dorsocentrals; scutellum with three strong pairs of marginal macrochaetae, with an apical cruciate weaker pair and without any discals. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3}; the bend of M_{1+2} destitute of an appendage. Tegulae white.

Abdomen subshining; very lightly silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third tergum very strongly arcuate; the fifth tergum readily marked off from the sixth at the lateral part but medially indistinguishable from it. The lateral width of the fifth tergum equal to about one-third the lateral width of the fourth abdominal segment; the sixth and seventh abdominal segments forming the somewhat distended genital segments.

Genitalia black; differing from all other known nearctic species in having an exceedingly long keel-like portion at the base of the inner forceps (named on account of this unusually long keel). The basal part of the outer forceps covered over by a broad, leaf-like portion.

The horseshoe-shaped indenture of the last sternite extending slightly more than half the distance to the base of the blade.

Described from four males collected by Mr. E. C. Van Dyke at Lake Tahoe, California on September 20th.

Type and one paratype in the Cal. Acad. Sci. One paratype in the Canadian National Collection, Ottawa. One paratype in the U. S. N. M.

(To be Continued.)

A REVIEW OF THE GENUS MONOCHAMUS SERV. (CERAMBYCIDAE, COLEOPTERA)

BY RALPH HOPPING,

Entomological Branch, Department of Agriculture, Ottawa.

A study of long series of the different species of this genus has made it evident that a few changes in the synonomy are necessary. The writer's interpretation of the North American species is expressed in the accompanying key.

Leng and Hamilton* place *obtusus* Casey and *oregonensis* Lec. as synonyms of *scutellatus;* but all three of them appear to be distinct. Col. Casey has transferred *oregonensis*** Lec. to the dentiform group, but the writer feels he must have mistaken a black form of *maculosus* for that species: this would account for the description of *monticola* Casey, which appears to be the true *oregonensis* Lec.

The most strongly maculated species are *titillator, maculosus, obtusus* and *marmorator. M. maculosus* may be densely black or reddish brown, although the red-brown individuals are probably newly emerged.

The length of the antennae varies greatly within the limits of each species and appears to the writer to be of little specific importance. The sexes, however, can be separated by antennal characters, since the females of all species have the antennae but little longer than the body, often with the segments bicolored, while the males have the antennae much longer than the body and the segments as a rule unicolorous.

The size varies greatly in each species apparently according to the condition of the food supply. Individuals are generally smaller in arid sections where the recently fallen or cut timber dries rapidly.

The key to the species herein submitted is based upon an examination of the material in the Oregon Agricultural College, very kindly loaned by Professor Lovett, the material in the collection of the California Academy of Sciences, that in the private collection of Dr. F. E. Blaisdell and Dr. E. C. Van Dyke, the Ottawa collection of the Entomological Branch and that of the author.

M. angusticollis is known only from the description. Of the species included in the table the writer has examined the following number of adults:—12 *marmorator,* 17 *obtusus,* 85 *maculosus,* 50 *titillator,* 102 *oregonensis,* more than 200 *notatus* and over 500 *scutellatus.*

Key to Species.

A. Apices of elytra produced into an acute spine or blunt process.

B. Process of elytral apex arising from sutural angle.

C. Process of elytral apex slender, acute or subacute; body and antennae comparatively slender; punctation of elytra sparse and fine, ashy vestiture in more or less definite areas; general color reddish *titillator* Fab

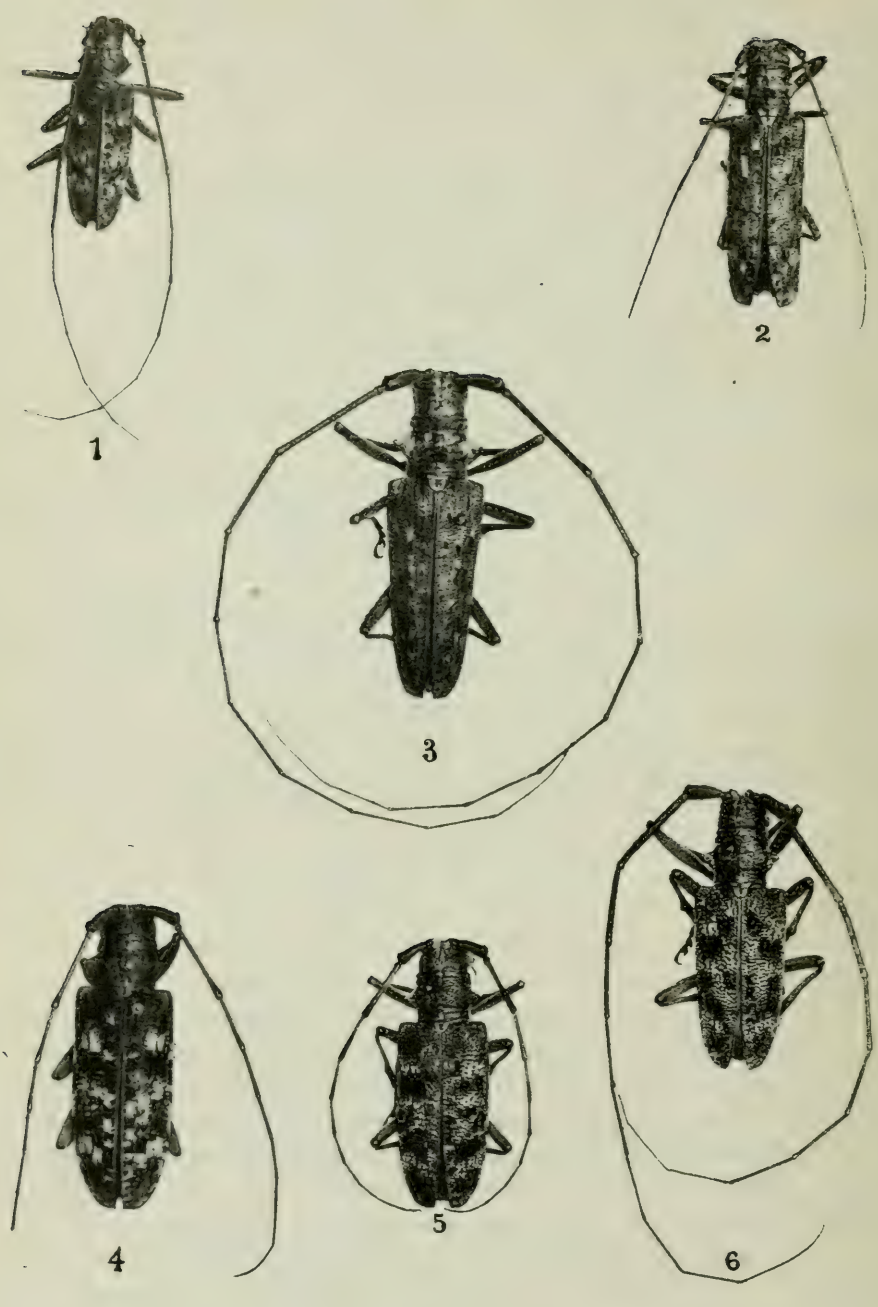
CC. Process of elytral apex blunt; body comparatively short and robust; punctation of elytra dense and coarse, ashy vestiture more or less diffused; general color black or rufous ..... *maculosus* Hald.

BB. Process of elytral apex not arising from sutural angle.

C. Process of elytral apex arising from the rounded apices, spinous *angusticollis* Casey

CC. Process of elytral apex arising from the obliquely prolonged apices; vestiture of elytra often in definite patches; general color yellowish brown ..... *marmorator* Kirby

*Transactions Am. Ent. Soc., 1896, XXIII, p. 109.
**Memoirs on the Coleoptera, IV, 1913.



THE GENUS MONOCHAMUS

Fig. 1.—*M. titillator*, ♂; 2.—*M. notatus* ♀; 3.—*M. notatus*, ♂; 4.—*M. titillator*, ♀; 5.—*M maculosus*, ♀; 6.—*M. maculosus* ♂. (All figures enlarged one-half.)

AA. Apices of elytra not produced into a spine or process.

B. Elytral apex obtusely angulated at the suture.

C. Elytra without raised linear elevations.

D. Scutellum generally covered with ashy scales, posterior margin rounded; elytra with a vague bronze lustre, maculation often entirely absent; general color black ..... *scutellatus* Say

DD. Scutellum bilobed or V-shaped with only the lobes covered with ashy scales and separated by a minute triangular glabrous area; maculation of elytra absent or sparse; general color densely black. *oregonensis* Lec.

CC. Elytra with raised linear elevations.

Scutellum sparsely clothed except towards the margins; elytra densely, finely punctured with scattered, raised, often linear, glabrous areas; general color greyish brown ..... *notatus* Drury

BB. Elytral apex not angulated at the suture, evenly rounded; punctation sparse and fine, scutellum glabrous and rufous; general color rufous. *obtusus* Casey

M. titillator Fab. (Lamia), 1775, Syst. Ent. p. 279.

carolinensis Oliv.; *minor* Lec.; *dentator* Fab.

Col. Casey has resurrected *carolinensis* Oliv. from the synonymy of this species. Leng and others treat the name as a synonym. In long series every variation in size, maculation and reduction of the spine into a blunt form may be found.

I have a specimen of *titillator* from the southern Sierras of California, which I collected over twenty-five years ago. I have, however, a strong suspicion that my California specimen came from lumber shipped from the east. Former reports of the capture of this species from California probably refer to *M. obtusus* Casey.

The slender antennae and the sparse punctation in the cinereous areas will always serve to separate this species from *maculosus*, besides the differences enumerated in the key; the vestiture consists of light brown or yellowish tomentose areas separated by cinereous areas, sparsely punctured. Specimens from the far north have only indications of the ashy areas, and seem narrower in form; however, I cannot separate them from *titillator* by any definite characters. Length, 13 to 25 mm.

Host.—Pinus palustris, P. strobus and probably all pines and *Abies balsamea.*

Habitat.—Eastern North America, extending west to Alabama in the south and possibly to British Columbia and Alaska.

M. maculosus Hald., 1874, Trans. Am. Phil. Soc., X, p. 51.

strenuus Casey; *oregonensis* Lec. (Casey); *clamator* Lec.

Col. Casey's interpretation of *M. oregonensis* Lec. as well as his *strenuus* seem to belong here. Occasional specimens of *maculosus* in a series from the same tree show all variations of "rusty brown tomentum". The length of the antennae is very variable in all species and series. The rugosities of the elytra are irregular in form, the vestiture consisting of dark brown, rusty brown or

black tomentum separated by cinereous areas of scales arranged in minute separated groups. Length, 16 to 26 mm.

Hosts.—Breeds more commonly in lodgepole pine (*Pinus contorta*) than in yellow pine (*Pinus ponderosa*).

Habitat.—Colorado, New Mexico, Arizona, California, Oregon, Washington, Nevada, Idaho and British Columbia.

M. angusticollis Casey, 1913, Mem. on the Coleop. IV, p. 292.

I have not seen this species nor can I find that it exists in any collection other than that of Col. Casey, which, since it comes from Texas, is not strange. Material from that state, in the Cerambycidae, seems to be notably absent in collections. The position of the apical spine would separate it from any other species. Length, 18.5 mm.

Host.—Unknown.

Habitat.—Texas.

M. marmorator Kirby, 1837, Faun. Bor. Am. IV, p. 169.

fautor Lec.; *acutus* Lacord.

The characters given in the key are amply sufficient to distinguish this species, which is still rare in collections. The vestiture of the elytra is ochraceous white and brown or black in more or less definite patches. Length, 18 to 25 mm.

Host.—Abies balsamea.

Habitat.—New York, Vermont, Nova Scotia to Great Lakes Region.

M. scutellatus Say, (Cerambyx), 1824, Long's Exp. II, p. 289.

resutor Kirby; *mutator* Lec.

I have this species from Alaska, Hudson's Bay, Michigan, Ontario and Massachusetts, and have seen specimens from all the spruce regions of Canada. The vestiture is either wanting or consisting of a few ashy, irregularly placed scales. Some females, however, are fairly well covered with ashy vestiture of no particular design.

Alaskan specimens generally have the femora red but do not seem to differ otherwise. The antennae, especially the scape, seem to be brownish and seldom black as in *M. oregonensis*, and have the elytra vaguely bronzed. The ♀ ♀ are generally smaller than the ♂ ♂. Length, 13 to 24 mm.

Hosts.—Pinus strobus, P. banksiana, P. resinosa, Picea canadensis, and *Abies balsamea.*

Habitat.—New England, Canada (except British Columbia), Alaska.

M. oregonensis Lec., 1873, Smiths. Misc. Coll., XI, No. 264, p. 231.

monticola Casey.

Mr. Lawrence Reynolds very kindly examined Le Conte's type for me. It was found to agree with what has always been called *oregonensis* in the west. The large stout form, dense black color, and the scutellum distinguish this species. The vestiture is much as in *scutellatus*. The ♀ ♀ are as large as or larger than the ♂ ♂. *M. oregonensis* is distributed throughout the west where *Pseudotsuga taxifolia* and *Abies concolor* are found, although it attacks other coniferous species within the area. Length, 13 to 30 mm.

Hosts.—Abies concolor, Abies magnifica, Pseudotsuga taxifolia, Pinus

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THE GENUS MONOCHAMUS

Fig. 1.—***M. marmorator***, ♀ ; 2.—*M. oregonensis*, ♀ ; 3.—*M. scutellatus*, ♀ ; 4.—***M. obtusus***, ♂ ; 5.—*M. scutellatus*, ♂ ; 6.—*M. oregonensis*, ♀ ; 7.—***M. obtusus***, ♀ ; 8.—*M. marmorator*, ♂ .

contorta. Specimens from *Pinus contorta* are usually smaller, with the elytra of the males more densely maculate.

Habitat.—British Columbia, Washington, Oregon, California, Nevada, Utah, Colorado, Arizona, New Mexico.

M. notatus Drury, 1773, Ills. of Nat. Hist. II, p. 65.

**confusor* Kirby.

This species can be readily distinguished by the smoky grey color. Occasionally the glabrous rugosities become obsolete, or may be rounded. It averages larger than any other species and is a good illustration of the tremendous variation in size, the minimum being .50 inch and the maximum 1.50 inch, an extreme variation of one inch. Length, 16 to 40 mm.

Hosts.—*Pinus strobus, P. banksiana, P. resinosa, P. ponderosa, Picea canadensis*.

Habitat.—Northeastern part of the U.S. and Canada, including British Columbia.

M. obtusus Casey, 1913, Mem. on the Coleop. IV, p. 293.

This is a very good species, breeding in pines of north central California, where the cross ranges connect the coast mountains with those of the interior. In maculation and punctation it is much nearer *titillator* than any other species, but has a remarkably short, robust form. The sutural length of the elytra is seldom more than twice the basal width, whereas in all other species it is much more than twice the basal width. The characters given in the key and enumerated by Col. Casey make it impossible to confuse this species with any other. Besides the specimens in my cabinet, I have seen a much larger series in the collection of the Academy of Sciences in San Francisco taken by Dr. E. P. Van Duzee. Length 19 to 23 mm.

Hosts.—*Pinus ponderosa, P. contorta*.

Habitat.—California (Lassen and Siskiyou Cos.)

A NEW WESTERN SYRPHID (DIPTERA).

BY C. HOWARD CURRAN,
Orillia, Ont.

Toxomerus occidentalis n. sp.

Mesogramma geminata Williston (in part).

Differs from *T. geminatus* Say in the shape of the process on the hind femora, which is shorter and bears a shorter and stouter arm; the front is wider in the female, the vertical triangle slightly wider in the male; band on first segment always interrupted in both sexes.

Length, 6.5 to 8 mm. ♂. Face yellow, below and at the sides finely silvery pubescent; cheeks black behind. Antennae reddish yellow, arista black; vertical triangle long, narrow, black, in front and at the vertex with yellowish pollen, in the middle very shining; eyes less distinctly touching than in *T. geminatus*, especially dorsally. Pile of the front whitish, a few blackish hairs immediately above the antennae, and entirely black on the vertical triangle.

*It is a little doubtful if Drury's species *notatus*, from Norway is our *confusor* and the latter name may have to be re-established.

Posterior orbits greyish pollinose, becoming more yellowish above.

Thorax shining greenish, somewhat bronzed black, with three broad, subcontiguous opaque brownish bronzed stripes; median cinereous line distinct on the anterior half. Yellow lateral margins complete. Pleurae bluish black, the mesopleura with oblong-oval yellow spot, and a white pubescent spot below it. Scutellum shining olivaceous black with yellow border. Pile of thorax and scutellum obscurely yellowish, the latter with a fringe of long black hairs; pleurae with sparse whitish pile.

Abdomen deep shining black; first segment with only the antero-sides or with a very narrow anterior border yellow. Second segment with a narrow median, slightly arcuate or straight, interrupted yellow band, the lateral margins in front of this narrowly yellow; or with the band almost obsolete and the margins black. Third segment with a median longitudinal yellowish line abbreviated at both ends, the black in front forming more or less of a circle; at each side with a basal, broad yellow band, with an oval production posteriorly at the inner end. Fourth segment with five yellow spots, the median one similar to the median line on the third segment; two elongate broad, longitudinal spots, their posterior ends rounded, situated each side of the median spot, and two sub-square spots, longer laterally, on the anterior angles. Fifth segment with the sides yellow, more narrowly so posteriorly. Apical margins of second to fifth segments yellow or reddish. In darker specimens the median lines are almost obsolete and the spots all smaller, those on the posterior angles of the fourth segment triangular and the apex of the fifth segment black. The spots on the third segment occupy not more than the anterior half of the segment where they are longest. (In *geminatus* they always occupy considerably more than half, even in very dark specimens.)

Legs yellow, including the hind coxae; posterior femora black, except the ends; tibiae with a black band near the end; hind tarsi brown, anterior tarsi reddish apically; the hind femora sometimes with only a black band subapically in the female. In the male the hind tibiae broadly produced at the apical end, and arcuate; hind femora strongly arcuate, the process near the base stouter and with shorter arm projecting posteriorly than in *geminatus*.

Wings hyaline, stigma yellowish brown.

♀. Antennae with the third joint broadly brownish above; face distinctly white pilose below; front shining black, black pilose; not as much narrowed above as in *geminatus* and the yellow on the sides also seems to be slightly narrower; abdomen, second pair of basal spots moderately broad, a little broader medially and laterally, interrupted medially by a roundish black circle with a dibber-shaped yellow spot in its middle, spots not reaching the margin; spots on the fourth segment enlarged postero-medially; fifth segment with triangular spots on the basal corners and a smaller anterior spot in the middle; in other respects as in the male.

Holotype. ♂, Victoria, B.C., May 5, 1919, (W. Downes).

Allotype. ♀, Saanich Dist., B.C., May 17, 1909 (Downes).

Types in the Canadian National Collection. Paratypes, 40 specimens of both sexes from California, Oregon and British Columbia.

This species is very distinct from *T. geminatus* Say and may be distinguished readily by its very dark shining appearance, and definitely distinguished in specimens which approach *geminatus* in color by the basal process on the hind femora. *T. geminatus* does not appear to be common west of the mountains, but I have specimens from British Columbia. I have seen no specimens of *occidentalis* from east of the Rockies. An occasional specimen has the first band only slightly interrupted.

A GENUS AND SPECIES OF SYRPHIDAE NEW TO CANADA

BY C. HOWARD CURRAN,
Orillia, Ont.

The type species of the genus *Chalcomyia, C. area* Loew, was taken in Illinois. A second species, which is herein described, was taken by the writer on May 8th, 1921, at Orillia, on the common wild black or pin cherry. Two specimens were taken late in the afternoon, which was sunny, but a cold wind was blowing. Both specimens were resting upon flowers and resembled a small Muscid. They were a good ten feet from the ground. The legs in this species are entirely deep steely black, as is the general color. *C. area* has the legs considerably pale.

Chalcomyia calcitrans n. sp.

Habitat.—Ontario: early spring; edge of woods.

♂. Length, 6 to 6.5 mm. Eyes bare, moderately separated. Face and front shining deep black, the face, except a broad median stripe, silvery pubescent; cheeks shining; facial pits long, almost as in *Chilosia*. Face wihout pile, in profile strongly convex, with small but conspicuous tubercle below the middle; oral margin projecting as far forward as the antennal base and produced moderately downward. Vertical triangle with sparse, long black and white pile behind the anterior ocellus; front bare. Posterior orbits with long gray pile below, becoming shorter and more whitish above. First antennal joint black, second brownish yellow, third reddish yellow; arista black, bare.

Thorax, scutellum, abdomen and legs deep shining bluish or greenish black. Thorax with short yellow pile, with some longer black hairs around the sides of the dorsum; pleurae almost bare. Scutellum short yellow pilose, with some longer black hairs apically. Abdomen with short, inconspicuous whitish pile, wholly shining. All the femora somewhat thickened; hind tibiae slightly arcuate, tarsi with pads of golden pubescence beneath.

Wings sub-hyaline, slightly tinged with luteous; stigma luteous.

The abdomen is almost triangular in shape, the hypopygium large and inclined to the right. The color appears bluish black to the naked eye, but slightly greenish black under the microscope. The fly is very shining.

Holotype.—♂, Orillia, Ontario, May 8, 1921 (Curran), in the Canadian National Collection, Ottawa. Paratype, ♂, same place and date, in the author's collection.

Since the above description was prepared two further specimens, both males, have been identified. They were taken at McDiarmid, Ont., by N. K. Bigelow, of the Ontario Museum, Toronto. The species is evidently northern in distribution.

BOOK REVIEW

APPLIED ENTOMOLOGY, AN INTRODUCTORY TEXT-BOOK OF INSECTS IN THEIR RELATION TO MAN, by H. T. Fernald, New York: McGraw-Hill Book Company, Inc. p. I–XIV, 1–386, 388 text figures, 1921.

This book, as stated by the author, is intended primarily as a classroom text for students in Agricultural colleges who do not intend to specialize in Entomology but "need it as a part of their agricultural education and particularly as a tool which they can use wherever insects are related to their special lines of work."

In attacking this problem of writing a combined text book of systematic and economic entomology, even for the class of students referred to, the author has undertaken a very difficult task and one which many teachers of the subject feel cannot be done satisfactorily. However, there are many teachers who hold the opposite view. But, whatever the view, this new book will be welcome to all as a valuable contribution to entomology and, whether it is used as a text book or not, it will often be consulted by teachers and students; for it is written in a very readable and interesting style and presents most of the essential facts of elementary systematic entomology in a new and attractive manner and also gives a fairly full account of most of our insect pests and of the methods of their control.

The first 58 pages are devoted almost entirely to an account of the external and internal structures of insects, their development, losses caused by them, nature's method of control, insecticides, fungicides and fumigation. Each of these topics is treated briefly and yet with sufficient fullness to give a good general knowledge of the subject.

The main part of the book, or a little more than 300 pages, is composed of a description of the characteristics and peculiarities of the different orders and of the chief families under these orders, together with a description of the chief insects of economic importance under each family, their habits, life histories and methods of control. Much attention is paid to this economic aspect and in consequence most of the very destructive insects of North America are discussed at considerable length.

There are many good illustrations and a few that are somewhat poor. A few more illustrations, especially of the immature stages of insects in certain orders, would have been an improvement and also the addition of a host index.

The life histories and control measures of the various insects discussed are, with a few exceptions, up-to-date and sufficiently full for the purpose.

There are a few typographical errors and inaccuracies here and there throughout the text but not sufficient to mar the value appreciably.

The book should be very welcome, not only to teachers and to undergraduates in agricultural colleges but also to many others who are interested in entomology.—L. Caesar.

OBITUARY.

The Rev. Thomas W. Fyles, d. c. l., f. l. s.

The Entomological Society of Ontario has lost its most aged member and one of its most devoted friends and supporters through the death of the Rev. Dr. Fyles, which took place at Ottawa on Tuesday, August 9th, 1921, after an operation for some internal trouble; his remains were interred in the Beechwood cemetery on the following Thursday. Born at "The Hermitage", Enfield Chase, England, on the first of June, 1832, he had entered upon his 90th year when he died. After completing his education in London he came to Canada in 1861 and took up his residence in Montreal. In 1864 he was ordained by Bishop Fulford in Christ Church Cathedral and was appointed to the charge of the parish of Ironhill in the Eastern Townships where he was instrumental in building a church and parsonage. After an incumbency of eight years he was transferred to Nelsonville, where also he succeeded in building a rectory; there he remained for eleven years doing faithful work among his parishioners, whose love and esteem he speedily won. In those days the Eastern Townships, lying south of Montreal and the other side of the St. Lawrence were inhabited by English-speaking farmers and others, mostly from "the old country", who were Protestant in their religion and largely members of the Church of England. Now very few of their descendants are to be found in that beautiful and fertile region of country, their places having been filled by French-speaking Roman Catholics.

With his inborn love of nature in all its aspects, Dr. Fyles enjoyed to the utmost the rural scenes and varied life of animals and plants with which he was surrounded. Mountains and hills, lakes, rivers and ponds, woodland streams and swamps, forest glades, flower-spangled meadows, orchard and garden, all were to him full of charm and interest, and gave him the utmost delight. While all nature was full of "the glory of God" and appealed to his heart's deepest emotions, he was devoted especially to the study of the manifold forms of insect life which were everywhere to be found about him. It thus came about that in the course of time he gradually formed a large and beautiful collection of butterflies, moths and other insects. The results of his observation and studies are to be found in many admirable papers which are published in the Annual Reports of the Entomological Society of Ontario, and which he read at its meetings.

In 1883, after spending nearly a score of happy years amid country scenes and kindly people, he removed to Levis, opposite the City of Quebec, and was employed by the Society for the Promotion of Christian Knowledge (London, England) as immigration Chaplain. For twenty-five years he filled this post, meeting all the incoming ships with their varied crowds of new settlers. To them, bewildered often by their new surroundings he was a veritable friend in need, and did much to relieve their difficulties and cheer them on their way. The work was sometimes very arduous when a number of large ships arrived fully loaded with passengers coming to the new lands of this vast Dominion.

During the winter months, when navigation was closed and the port of Quebec securely ice-bound, Dr. Fyles had time to devote to his favourite study

of Entomology. In 1897 he succeeded in the formation of the Quebec Branch of our Society, acting as its President and in fact its mainstay, as after his departure in 1909, the Branch, in spite of heroic efforts on the part of some of its members, gradually died out through having lost its inspiration and its guide. In recognition of his learning and ability, he was appointed Honorary Professor of Biology in Morrin College, Quebec; Fellow of the Linnean Society of London; and given the honorary Degree of D. C. L. by the University of Bishops' College, Lennoxville, Quebec. From 1899 to 1901 he was President of the Entomological Society of Ontario, and its delegate to the Royal Society of Canada in 1890, 1894 and 1895; he was also for many years a member of the Council of the Society and of the Editing Committee of the "Canadian Entomologist."

In 1909 he gave up his work at the Port of Quebec owing in some measure to an accident which had injured his foot and impaired his powers of walking and former activity. Before leaving, his fine collections were transferred to the Museum in the Quebec Parliament Buildings, where, no doubt, they are well looked after and carefully preserved. On his retirement and resignation of active work, at the age of 77 years, he had well earned a period of rest. He spent three years at Hull and in 1912 removed across the river to Ottawa, where he remained until the hour of his death.

Dr. Fyles was a constant contributor during a long series of years, to the publications of the Entomological Society of Ontario. His first papers in the "Canadian Entomologist" were "Notes on a Gall-mite of the Nettle-Tree (*Celtis occidentalis*)" in October, 1882, and "A Description of a Dipterous Parasite of *Phylloxera vastatrix, Diplosis grassator,* new species" in December, 1882. The latter was also published, as his first contribution to the Annual Reports, in the Fourteenth, for 1883. Many papers of a descriptive or systematic character appeared in the magazine, but his most characteristic articles were those read at the meetings of the Society and published in the Reports. His inimitable manner of reading and the keen humour that pervaded many of them charmed his audience and will not soon be forgotten by those who had the privilege and opportunity of hearing them.

For thirty-four years he never failed to furnish a paper for our meetings; the last, in 1916 on "The Naturalist in the City", describing various incidents that came under his observation while living in Ottawa. Among the seventy-six papers that appeared in the Reports were many that showed his extensive knowledge of Entomology in most of its orders, as may be learnt from the following titles: "Certain Forms of Neuroptera in their Relation to the Fishing Interests"; "Butterflies" with tables for the determination of the species found in the Province of Quebec; "The Sphingidae of Quebec Province", with similar useful tables; "Dragon-flies of Quebec"; "Crickets"; "Paper-making Wasps"; "Food-habits of Hymenopterous Larvae"; "Hemiptera"; "Two-winged Flies"; "Forest Insects"; "The Tussock Moths"; "Notodontidae" and several others.

His most delightful papers, however, were of a different character and in his own wonderful style that charmed those who heard or read them. The following series may be mentioned especially: "Voices of the Night", "The Pool",

"The Stream", "Green Lanes and Byways", and "Mountains and Hills". In these papers are depicted not only varied forms of insect life, but also observations of other living creatures in air and water and on earth. All living things among animals and plants were of engrossing interest to this keen-eyed lover of nature in all its aspects.

A few other remarkable papers may be mentioned as examples of his literary tastes and skill: "Visit to the Canadian Haunts of Philip Henry Gosse" (author of the "Canadian Naturalist"); "How the Forest of Bedford was Swept Away"; "The Entomology of Shakespeare"; and "Entomological Mistakes of Authors".

Dr. Fyles was no mean artist, as the original illustrations in many of his papers plainly show. He was also in the habit of presenting large colored diagrams of the insects that he referred to in his lectures and addresses. He presented a large, handsomely bound folio volume of these diagrams to the Society's library as an expression of his gratitude for all the Society had been to him during a long series of years.

He was a notable example of an old-time naturalist, a class of nature-lovers now almost extinct in these days of specialization and devotion on some single family or group of insects. His innate interest found scope in his boyish days when, after his father's early death, he spent many summer holidays at the country home of his grandmother, and together with his uncle, Edwin Tearle, at that time a boy of about the same age, roamed the woods and hills in search of birds and butterflies. To this friend and companion he was much devoted and after coming to Canada kept up a long correspondence with the exchange of verses. In the two volumes of poems that he published are references to this friend of earlier days.

The writer may conclude this sketch of a beloved and revered friend with a quotation from a letter received from him a few years ago:—

"I look back and I thank God for the brightening of my life that my connection with the Entomological Society of Ontario has been to me, and yet a feeling of sadness comes over me when I think of the good old friends who have passed "the Great Divide", and every change seems to say—the days darken round us and the years, among new men, strange faces, other minds—and the remembrance of our departed friends calls for thankfullness, for it is a pleasant remembrance, yes, and I am thankful". Charles J. S. Bethune.

CORRECTIONS AND EMENDATIONS

P. 184. Transpose line 5 to follow line 2.

Prof. T. D. A. Cockerell has called my attention to the fact that the genus *Vitrinella*, proposed by me for a Geometrid genus (1920, Studies in N. Am. Cleorini, 27) is preoccupied by *Vitrinella* Adams (1850) in Mollusca. The name *Anavitrinella* may be used to replace it

I might also note that in the above mentioned paper the species *agrestaria* Grossb. was omitted, by oversight, from the genus *Pterotaea*, although figured under this generic name on Plate VI, fig. 11. J. McDunnough.

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POPULAR AND PRACTICAL ENTOMOLOGY

The Life History of a Hobby Horse

By FRANCIS J. A. MORRIS,

Peterborough, Ont.

Part III.—Second Childhood—The Tree's Incline.

(Continued from Page 245).

At the head of Corbett's pond the spring after the water level was permanently lowered I spent several hours one Saturday observing a multitude of Plover, Snipe, and Sandpipers feeding on the rich alluvial surface. The first thing I saw on approaching was a flock of seven or eight Black-bellied Plover which I had put up in the forenoon from Duck Harbour four miles away; then two Golden Plover, the only time to my knowledge I have ever seen this bird. Both these kinds were very wild and flew rapidly out of sight up the Ganeraska in a north-westerly direction. By good luck I happened on an excellent "hide", a hollow on the slope of the bank a few yards from the water, screened from the cold north-west wind by the top of the bank and hidden from view by a fringe of willow bushes, through which I could watch the birds feeding. Most of the time my glasses were trained across a narrow arm of the Ganeraska on to a delta of black mud dotted with sand patches, little thickets of dead sticks, and shallow pools of water. The birds were very numerous, the different species moving about in small flocks that often intermingled; sometimes three or four species feeding sociably together in a single group; for the most part they seemed strangely silent, but this was probably due to the distance and the peculiar character of "field-glass" views; birds at quite a distance being brought right up to the eye, so that you felt almost as if you could lay your spare hand on the bird by a sudden pounce down behind the glasses. Moreover I was to windward, and when the breeze dropped I fancied I could hear faint twitterings. It was very interesting to see the quick nervous movements of the birds, almost as restless as Snowbirds in a blizzard, but with much less use of the wings; all showed the curious "teetering" fore and aft, that has given the Least Sandpiper its popular name, accompanied by frequent bobbing of head and neck and flirting of tail; but prettiest sight of all was their quick, clean step and dainty tread about the tiny sandbars and mud flats that made the shores of their Liliputian lakes. There were at least seven species, but I was able to identify five only with certainty: the Least Sandpiper, the Solitary, the Spotted and the Red-backed; the last of these remarkable for the large disk of jet on its belly which gives it the local name of "black-heart" among the gunners; the most exquisite of all these "limicolæ" or mud-haunters was a tiny white-throated, white-breasted and -bellied bird, with a black collar round the neck, a dusky head, and grey-brown back and wings; it looked for all the world like a dwarf Killdeer, and as a flock of Killdeer came down from the field behind me and settled on the delta, I was able to

compare the two at my leisure. The stranger was the Semi-palmated Plover and appeared surprisingly tame; three or four twice crossed the river-arm and settled on the sand just beyond my willow screen, either never suspecting my presence or utterly fearless.

In Choate's Wood itself, a little way above the pond, I heard one day the most awful racket of crows; the noise started with a few sharp caws and rising rapidly to a deafening babel, subsided more slowly into dead silence; after a few moments this performance was repeated. Stepping softly forward through the aisles of beech and maple I presently came upon scores and scores of crows filling the tops of two large trees; at first I couldn't make head or tail of the phenomenon, or rather it seemed to be all heads and tails, without a meaning, though full enough of sound and fury. But presently the mystery was explained. In one tree the crows seemed to keep pretty still, but in the other I noticed they kept hopping and jumping downwards and athwart, gradually edging nearer and nearer to a projecting limb; as soon as my eye rested on the limb the mystery was cleared up. There at the end of a branch sat a large owl, apparently wrapped in meditation and unconscious that the tide of this jabbering parliament was setting its way; soon, however, it began to show signs of nervousness, blinking and turning its neck this way and that; whenever it moved as though to fly the excitement of its persecutors broke out into sharp caws; and when it actually took wing, the whole host of crows from both trees precipitated themselves upon it with deafening cries and it was forced to settle almost immediately. Apparently no crow dared come to close quarters with it as long as it kept its perch.

The North Wood was famous for my first Scarlet Tanager and the Indigo Bunting; it was also a favorite resort of the Crested Flycatcher and the Oven-bird. The fields just northeast of here were memorable for the Bartramian Sandpiper, observed first at the end of April while at its tamest before nesting, and beautifully vocal with its call note in an astonishingly long curve of sound; beginning on a low almost guttural burr and rising energetically like the spirt of a fountain to the top of its pitch, where it passes from trill or burr to a characteristic plover wail that falls away and dies on about the note it opens with—"Pr-r-r-r-r-ee-eep-wee-ee-ee-ee." During the nesting season the birds are seldom heard even at the moment of alighting, while raising the wings over the head and folding them slowly down to the sides; this is their favorite call moment at other times, but while eggs and young are in the nest they forego even this. South of the "Rockies" lies a great stretch of pasture lands, in which the Bartramian Sandpiper has lately come to breed in great numbers, and here occasionally in early spring I have had the pleasure of flushing a small flock of Yellow-legs from marshy pools; their attitudes, movements and sounds of alarm before taking to wing, being all most interesting to note.

The Newtonville Swamp included a very rich sphagnum moss bog at its west end, where I made finds of nearly all the orchids known to me in the Rideau district as well as some new ones; it was also the scene of several of my most interesting bird discoveries. I took field glasses with me on my first trip there and while gloating over a wealth of Stemless Ladies' Slippers growing

in the shade of pines and among bushes of huckleberry, I heard at intervals what absent-mindedly I set down as the distant hoot of an owl, soft and plaintive; suddenly, I sat up and listened attentively,—an owl? at noon? on a bright June day? What a fool I was! By noting the direction of the sound I was soon able to train my glasses on to a small group of trees not very far away and to my delight discovered the singer on a high branch of white pine; from colour and shape, especially the head and neck, it appeared to be a pigeon; taken in conjunction with its call the evidence pointed conclusively to the Mourning Dove; the call has great charm, being softly plaintive, suiting the lonely swamps and pine woods where it loves to dwell. One of the prettiest sights I have ever seen was a family of four of these birds perched side by side on a pine branch overlooking a stretch of hazel and scrub oak in which I had been studying a colony of ground robins (the Chewink or Towhee).

Not very long afterwards, on the edge of this Newtonville Swamp, as I sat munching some bread and cheese on a hummock of moss, I heard almost over my head the ineffably sweet call of the "White-throat" Sparrow (the Peabody or Canada bird), and with my glasses was able to detect the songster in a tamarac almost at my side. When these birds first come back in the spring they linger for days about the gardens and orchards, and like the Warblers on their migration flight are very sociable; I once saw three species of sparrows all together in the top of a spruce beside my window at the School; two of the birds were the White-throat and the White-crowned Sparrow. The bird sings all the season and there is hardly any secluded swamp where it may not be heard; in the Algonquin Park their call is on every side from June until August. Yet again in this swamp while botanizing with an old college friend from Liverpool we were attacked by a large pair of hawks, and finally surprised two young ones just able to fly, in the centre of a great trodden space that can best be described as a shambles; three rabbit skulls, two pair of yellow hen's legs, a crow, and many gruesome tufts of fur and feathers being scattered about. One day in this swamp while taking some boys of the school Field Club to see the Pitcher Plants, Sundews, Orchids and Heaths, we surprised a Bittern on its nest; I do not think we should have seen the bird at all but it betrayed its presence by an angry hiss like a snake's, and presently we saw the long sharp dagger of its beak with a glittering eye behind it (the jewel in the haft) thrust up through a clump of Black Huckleberry (*Gaylussacia resinosa*). Among the boys at the school was a little Swiss from Mexico who once brought me from his home a bunch of some tropical orchids gathered from a tree; I had these set up in a greenhouse in sphagnum moss and two years later they thrust out a gorgeous display of blossoms. This boy was fairly fascinated that day in the swamp by his first sight of the insectivorous plants of the sphagnum. When the botanical collections were handed in that July, I found among my Mexican pupil's specimens a beautifully pressed pair of Pitcher-plant leaves with the long-stalked nodding flower between, and underneath, the legend—"Jug-plant!"

This Field Club had certain highly prized privileges; the boys were given extended bounds and an occasional half holiday for an outing in June. As birds' nesting was taboo and flower hunting tame to many of the robuster

spirits, these last appear to have put their heads together one spring in secret conclave.

We never know what is in the lap of the gods, and the day that followed our Field Club's Spring "revival" meeting, dawned much as other April days; it was only months later that I realized how big with history it had been. Shortly before breakfast a deputation of six boys filed into my room to know if I would add to the annual prize competition of Flowers, Foliage and Ferns, by including Insects, and admit them to the Club as bug-hunters.

After a little consideration I agreed to this, and wrote a short article on the comparative advantages of collecting Butterflies and Moths, or Beetles, which appeared in the next issue of the School magazine. I may have emphasized the ease of setting and preserving beetles as against the difficulty of catching and mounting butterflies. It was fate's irony if I did. At any rate about five pairs of partners applied for membership and three of these chose beetles for their hobby. I had already copies of Holland's two books on Butterflies and on Moths, and identification was fairly straightforward in the Lepidoptera; though I am free to admit being greatly relieved at the end of the summer to find, in a big collection of sixteen cases made by a pupil at Grosse Ile, Michigan, that nearly all the specimens had been determined and named by the collector and his sister at home during the holidays.

But Beetles were a horse of another colour altogether, and I soon found myself in a hopeless quandary over their names. Boys came to my room morning, noon, and night, with specimens to be identified, and in a few weeks, out of sheer desperation I began a collection for myself, and secured a copy of Comstock's "Manual for the Study of Insects", Le Conte and Horn's "Key to the Generic Classification of North American Coleoptera", and Knobel's Illustrated Booklet on "Beetles of New England". In a month I was in an advanced stage of the disease, and have suffered an annual outbreak of it ever since, just as regular in its recurrence as ague or a dose of Poison Ivy.

The most enthusiastic pair of Beetle collectors in the Club—apart from the President and his runningmate, a dentist in the town—were a boy from Algoma Mills near the Soo and his partner from New Orleans. One of these young bug-hunters had done some reading on the subject, and by a process of reasoning not uncommon had framed an infallible test for all possible beetle-problems; whenever the whoop of a new capture went up, Whitney McQuire could be heard shouting breathlessly, as he raced to the scene of action—"Did you count its legs?" I suppose his syllogism must have run like this: All insects are six-leggers; Beetles are six-leggers; *argal* All six-leggers are beetles. I am afraid I may have helped to clinch this Dogberry reasoning, for I ruled out two specimens of sow-bugs and a flat spider-scorpion, taken by him under bark, from his first collection of beetles on the score of an improper complement of legs. Of course, the counting of legs has its uses, but also its limitations. It obviously wouldn't have made any difference to the Scotch gardener who accused my cousin once of stealing strawberries, and received the suggestion that birds had been the thieves with a wise head-shake and the remark: "Ah! Mr. Harry, two-

legged birds"—an unhappy improvement on the proverbial mice. And I doubt whether it would have helped the railway guard in his famous dispute with Frank Buckland. We are told that Buckland was just boarding a train with a pet monkey when he was stopped by the guard and told that he must pay for his pet's journey in accordance with the company's regulations governing dogs; to enforce his protests the naturalist drew a live tortoise out of his coat pocket and said, "Well! what about this?" The man scratched his head completely non-plussed for a moment; then a happy thought spread across his face in a broad grin, as he answered, "Oh! that's all right; that's a hinsec', and they're free." The world hasn't moved far since Buckland's day and I have often been applied to for advice not strictly entomological. I remember once a hurry call over the 'phone from a drug store, when the following conversation took place: "Hello! Is that Mr. Morris?" "Yes." "Is it you that's interested in bugs?" "Yes." "Well! say, there's a big lizard down in the cellar and we'd like you to come and see it."

As most of my papers in the "Entomologist" describe in detail the symptoms of this now familiar *Coleopteritis*, I shall not say more about it here. As child, as boy and man, and in this second childhood of finding my feet in a new world, from first to last my interest has been purely an amateur's delight in the beauties of Nature. All that can fairly be asked of a hobby is to give pleasure; utility is a mere accident, and it would be waste of breath to recommend the pastime where it affords neither pleasure nor interest. I suppose it is quite illogical of me, therefore, to cherish as I do the memory of a rare occasion on which my hobby was translated into terms of dollars and cents.

One summer evening as I sat in my room I heard a rig drive hastily up to the school; in less than a minute my door was flung unceremoniously open, and in rushed a stout man with spectacles, breathless with excitement, his arms full of a mass of meadowgrass and weeds. As soon as he could speak he told me he had been calling at a farm house and while he talked at the door, his mare, a valuable race horse, had cropped some weeds on the edge of an orchard and got poisoned. She was lying in the stable frothing at the mouth and heaving. If I could tell him what the poison was he thought he could save the animal. He was a Vet. by profession and knew the common antidotes. I took the sheaf of herbage from him and looked it carefully over. There were no flowers, but I noticed some tall, rank stems with tiny buds on them and dark divided leaves that looked like a buttercup's. Hastily turning up Britton and Brown I ran through *Ranunculaceae*, and *eureka!* it was aconite. The antidote was administered and the mare recovered:—*post hoc, ergo propter hoc;* the Vet. credited me with the cure, and not long after I was shown an entry in the Bursar's ledger:

> Item: To attending School cow during sickness—$12.00
> cancelled on account of having my mare saved by a member of the school staff.

Like Lucky Hans I had swapped my horse for a cow.

A REVISION OF THE NEARCTIC SPECIES OF THE TACHINID GENUS ERNESTIA R. D. (DIPTERA)

BY DR. JOHN D. TOTHILL,
In Charge of Natural Control Investigations, Entomological Branch, Ottawa.

(Continued from Page 252).

Ernestia platycarina sp. n.

Description of male. Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi ranging from yellow to black. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to the base of the eye equal to about one-third of the eye height. Sides of the face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose, without any carina. Antennae reaching the lowest fourth of the face, all three segments black; third segment about one and one-half times as long as the second. Arista thickened on basal two-fifths, the penultimate segment slightly longer than broad. Width of the front at the narrowest point measuring a shade less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, darkbrown, at the narrowest point about equal to the width of either side of the front just cephalad of the ocellar triangle. No orbital bristles, ocellars well developed and proclinate, the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes distinctly rufous at the apex. Three sternopleurals; three to four dorsocentrals, these showing considerable variability; scutellum with three marginal pairs of macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{1+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3}. Bend of M_{1+2} without an appendage. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third abdominal segment somewhat arcuate. The fifth tergum marked off—especially laterally—by a suture from the sixth, and at the lateral part being about one-fifth as long as the lateral part of the fourth segment. The sixth and seventh abdominal segments forming the somewhat prominent genital segments.

Genitalia rufous. The basal part of the outer forceps with a broad, leaf-like expansion; the basal part of the inner forceps with a short, keel-like median projection. The edge of this projection farthest from the penis is flattened, and this forms a ready means of distinguishing the species.

The horseshoe-like indenture extends about two-fifths to the base of the fifth sternite.

Described from ten males collected by Messrs. R. S. Sherman, A. M. Caudell, C. H. T. Townsend and William Palmer, from Savary Island, B. C., Bear Lake, B. C., Franconia N. H., White Mountains, Peaks of Otter, Va., and Great Falls, Va.

Type, No. 24359 in the U. S. N. M., Washington, D. C. Paratypes in the National Collection at Ottawa.

Ernestia sulcocarina sp. n.

Description of male. Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi yellowish at tip; infuscated below. Eyes hairy. Cheeks (below the eye) white pollinose on black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of the face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose, without a carina. Antennae reaching the lowest fourth of the face, the first and third segments black, the second black, but usually reddish at distal end; third segment about one and one-half times as long as the second. Arista thickened on basal half, the penultimate segment somewhat longer than broad. Width of front at narrowest point measuring less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at the narrowest point as wide as either side of front just cephalad of the ocellar triangle. No orbital bristles; the ocellars proclinate; the single row of frontal bristles descending nearly to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes somewhat rufous toward the apex. Sternopleurals variable, sometimes three, sometimes four; four dorsocentrals; scutellum with three marginal pairs of macrochaetae and an apical cruciate pair. Legs black; the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline. R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3}. Bend of M_{1+2} with a minute appendage in some cases. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third segment arcuate. The fifth tergum marked off from the shining sixth by a somewhat faint suture, laterally it is about one-fourth as long as the neighboring part of the fourth segment. The sixth and seventh abdominal segments forming prominent genital segments.

Genitalia black. The basal part of the outer forceps with a broad, leaf like expansion. The basal part of the inner forceps with a median keel-like projection and the edge of this projection furthest removed from the penis is sulcate.

The horseshoe-like indenture extends about three-fourths of the distance to the base of the fifth sternite.

Described from ten males taken by Messrs. C. Garrett, A. B. Baird

and J. B. Wallis at Cranbrook, B. C., Lillooet, B. C., and Husavick, Man., also one male taken by J. M. Aldrich at Anchorage, Alaska.

Type in the National Collection at Ottawa. Five paratypes, No. 24358, in the U. S. National Museum, Washington, D. C.

Ernestia bicarina sp. n.

Description of male. Head at vibrissae about as thick as at base of antennae; vibrissae far above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lower fourth. Facial depression silvery pollinose without any carina. Antennae in male reaching the lowest fourth of face, all three segments black; third segment about one and one-fourth times as long as second. Arista thickened on basal two-fifths to one-half, the penultimate segment from one and one-half times to twice as long as the first. Width of front at narrowest point measuring less than the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown, at narrowest point equal to the width of either side of front just cephalad of the ocellar triangle. No orbital bristles in male, the proclinate ocellar bristles somewhat weak; the single row of frontal bristles descending almost to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that is very faintly tinged reddish, especially at the apex. Three sternopleural bristles and three pairs of dorsocentral macrochaetae; scutellum with three pairs of marginal macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{1+5} (third vein) with a group of two to five hairs both above and below at the junction with R_{2+3}. Tegulae white.

Abdomen subshining; lightly silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third tergum strongly arcuate. The fifth tergum distinctly marked off by a suture from the shining sixth and being a third as long laterally as the lateral part of the fourth. The sixth and seventh abdominal segments forming somewhat distended genital segments.

Genitalia black. The basal part of the outer forceps is extended into a broad, leaf-like portion. The basal part of the inner forceps with two median keel-like projections placed side by side and resulting evidently from the splitting of what was originally one median keel-like projection.

The horseshoe-shaped indenture extends about two-fifths the distance to the base of the fifth sternite. Each prong tipped with a short spine.

Described from four males from Bear Lake, B.C., Bozeman, Montana, and Tennessee Pass, Colorado, taken by Messrs. R. P. Currie and R. Parker.

Type No. 24359 in the U. S. National Museum, Washington, D.C. One paratype in the Canadian National Collection at Ottawa.

Ernestia ampelus Walk.

Head at vibrissae about as thick as at base of antennae; vibrissae well above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of bristles at the oral margin. Distance from the oral margin to the base of the eye equal to about one-third of the eye height. Sides of the face covered with silvery pollen; bare; narrowest width slightly less than the length of the second antennal segment. Facial ridges bristly on lowest fourth. Facial depression silvery pollinose without any carina. Antennae reaching the lowest fourth of the face, in male all segments black except the distal end of the second, which is usually reddish; in the female the first two segments reddish-yellow, the third segment black; in both sexes the third segment about one and one-fourth times as long as the second. Arista thickened on basal two-fifths to one-half, the penultimate segment about twice as long as broad. Width of front at narrowest point measuring in male about the length of, in the female about twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, dark-brown; at narrowest point as wide or slightly wider than either side of the front just cephalad of the ocellar triangle. Orbital bristles present in female, absent in male; ocellars well developed, especially in the female; the single row of frontal bristles descending almost to the base of the third antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes rufous toward the apex. Three sternopleural and four dorsocentral macrochaetae, scutellum with three pairs of marginal macrochaetae and an apical cruciate pair. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to seven hairs both above and below at the junction of R_{2+3}; bend of M_{1+2} appendiculate in some of the males, destitute of an appendage in most of the females. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground; the fourth abdominal segment in the female rufous. Discal and marginal macrochaetae present on second, third and fourth abdominal segments. The hind margin of the third tergite not conspicuously arcuate even in the male. Fifth tergite in male black or rufous and marked off from the sixth by a suture only on the lateral parts, its greatest length equal to one-fifth the length of the lateral part of the fourth. The sixth and seventh abdominal segments forming in the male prominent genital segments.

Male genitalia rufous. The basal part of the outer forceps covered by a leaf-like expansion. The basal part of the inner forceps with two conspicuous projections placed side by side, seemingly derived from forms in which a keel-like projection had become split.

The horseshoe-like indenture in the male extends about two-fifths the distance to the base of the last sternite.

Redescribed from a long series of males and females in the U. S. National Museum and the National Collection at Ottawa.

This is the principal Tachinid parasite of *Hyphantria cunea* in both eastern and western Canada.

Ernestia fissicarina sp. n.

Description of male. Head at vibrissae about as thick as at base of antennae. Vibrissae well above the oral margin. Palpi yellow. Eyes hairy. Cheeks (below the eyes) white pollinose on a black ground, subshining on the lower hairy part, a row of stouter hairs or bristles at the oral margin. Distance from the oral margin to base of eye equal to about one-third the eye height. Sides of face covered with silvery pollen; bare; narrowest width equal to the length of the second antennal segment. Facial ridges bristly on the lowest fourth. Facial depression silvery pollinose without any carina. Antennae reaching to the lowest fourth of the face, the first two segments yellowish, the third black; third segment about one and one-half times as long as the second. Arista thickened on basal three-fifths, the penultimate segment about twice as long as broad. Width of front at narrowest point equal to about one-half the width of an eye and equal to almost twice the length of the second antennal segment; the front silvery pollinose; frontal vitta dull, reddish brown, at narrowest point slightly more than half the width of front at vertex, i.e; unusually broad. No orbital bristles, the proclinate ocellars well-developed; the single row of frontal bristles descending considerably past the insertion of the second antennal segment.

Thorax subshining, black, covered with gray pollen; scutellum gray pollinose on a black ground that becomes rufous toward the apex. Three sternopleural bristles and four pairs of dorsocentrals; scutellum with only two pairs of marginal macrochaetae and with an apical cruciate pair; the cruciate pair and the pair next to it are directed at right angles to the dorsum. Legs black, the middle tibiae with two or more bristles on the front side near the middle, the hind tibiae without a comb-like row of bristles on the outer side. Wings hyaline; R_{4+5} (third vein) with a group of two to five hairs both above and below at the junction of R_{2+3}; bend of M_{1+2} destitute of an appendage. Tegulae white.

Abdomen subshining; silvery pollinose on a black ground. Discal and marginal macrochaetae present on the second, third and fourth abdominal segments. The hind margin of the third abdominal segment somewhat arcuate but not strikingly so. The fifth tergum marked off rather indistinctly from the shining sixth and at the lateral part being about one-fourth the length of the lateral part of the fourth. The sixth and seventh abdominal segments forming fairly prominent genital segments.

Genitalia black. The basal part of the outer forceps covered by a leaf-like expansion. The basal part of the inner forceps with a median keel-like portion that has become split, each half of it having become reduced to a mere knob, as in the case of *Ernestia ampelus* Walker.

The horseshoe-like indenture in the male extends about half the distance to the base of the last sternite.

Described from a single male collected by Mr. E. P. Van Duzee at Pismo, California on April 25th.

Type in the California Academy of Science, San Francisco.

NEW SPECIES OF CANADIAN SYRPHIDAE, (DIPTERA) Pt. I.

BY C. HOWARD CURRAN,
Orillia, Ont.

Melanostoma squamulae, new species

Head and thorax wholly black pilose; squamae blackish or brown, fringed with black pile.

Length, 7.5 to 9 mm. Male. Face a little prominent below, very little concave between the antennal base and tip of tubercle which is more prominent than, and close to the oral margin. Face greenish black, scarcely pollinose on the sides. Antennae black, third joint brown, its base reddish; arista brown. Frontal triangle chiefly opaque black. Head and thorax everywhere with rather longish black pile. Thorax and scutellum deep greenish black, with a bluish reflection in some lights, on the disc somewhat opaque. Abdomen opaque black, the sides of a shining bronze color which is a little broadened on the sides of the second segment, and produced as triangular areas on the anterior half of the third and fourth segments; fifth segment greenish bronze colored. Pile on the sides of the abdomen all black, with many longer, stronger black hairs, on the disc, shorter, more or less yellowish. Legs black, knees yellow, anterior four tibiae and tarsi brownish red, all the tibiae with a row of strong hairs in front. Wings distinctly brownish or blackish, stigma and subcostal cell luteous. Squamae brown, the fringe of hairs black.

Female. Front broad, shining greenish black, the broad transverse depression appearing opaque; black pilose. Thorax chiefly yellowish white pilose, but with longer black hairs intermixed on the dorsum and on the scutellum. The shining portion of the abdomen is aeneous greenish, the shining bands all wider than in the male and the opaque on the third and fourth segments is interrupted medianly, the shining band on the fourth segment is complete; pile whitish; legs with the tibiae and tarsi more extensively reddish yellow. Squamae tinged with brownish, with brown fringe. Wings slightly clouded beyond the middle.

Holotype, ♂, *Allotype,* ♀, Victoria, B.C., April and May, in the Canadian National Collection, Ottawa.

Paratypes, 3 ♂ s, Victoria, B.C., in the National Collection and the writer's collection.

The male seems very distinct from any described species and is a very dark appearing insect. The almost wholly shining face is very distinctive in both sexes, as are the brownish or blackish wings in the male, and the clouded wing in the female, although this dense coloration may not hold good in a long series. The female resembles *M. obscurum*, etc., but the shining, less prominent face and darkened squamae at once distinguish it from other species.

Melanostoma chilosia, new species

Abdomen (♀) wholly shining; tubercle and oral margin very prominent.

Length, 6.5 mm. al. 5.5 mm. ♀. Face shining black, thinly whitish pollinose, leaving the tubercle and a stripe on the cheeks wholly shining; in profile a little produced to the prominent, rather pointed tubercle, below which it is rather moderately and shortly concave to the not quite so prominent oral tip; face produced very slightly downwards anteriorly. Front deep shining black

broad, with black pile; Pile of head, thorax and abdomen whitish, or a little yellowish on dorsum of thorax. Thorax, scutellum and abdomen shining metallic bluish black. Legs black, knees reddish, anterior four tibiae and tarsi brownish. Squamae and fringe of hairs whitish; halteres yellowish. Wings hyaline. Stigma pallidly yellowish.

Holotype, ♀, Banff, Alberta, (N. B. Sansom), in the Canadian National Collection, Ottawa.

This species is very distinct from any other species I have seen, and is very similar in every respect to *Chilosia* but lacks the facial grooves.

Melanostoma lata, new species

Large; face evenly thinly yellowish gray pollinose; otherwise very much like *M. stegnum* Say.

Length 10 mm. al. 9 mm. ♀. Face and front shining, rather greenish or bluish black, the ground color sub-obscured, except on the tubercle and except a median band on the front, by yellowish gray pollen. In profile the lower part of the face is prominent, and is produced a little downwards, the tubercle about as prominent as the oral margin. Antennae black, third joint brown, about as long as the first two together, its apex evenly rounded; arista brown, not much longer than third joint. Front broad, black pilose; head elsewhere whitish or yellowish pilose. Thorax and scutellum shining deep blue-black, with short, abundant straw-colored pile, the middle of the dorsum with stouter black pile. Abdomen opaque black, the first segment, triangular spots on the anterior half of the second, a broad crossband on the posterior half of the third and fourth segments shining aeneous greenish. Pile of abdomen, where discernible, pallidly straw-colored, but extremely short on the disc. Legs with the femora, except the ends, black, tibiae brown, their bases and ends of the femora yellow; tarsi black, hind basitarsi a little swollen, especially basally. Wings slightly yellowish, the stigma and subcostal cell light brownish.

Holotype, ♀, White Horse, Yukon Territory, July-Aug., 1920, (A. P. Hawes), in the Canadian National Collection, Ottawa.

This species bears a striking resemblance to *M. stegnum* Thoms., but is distinct in the evenly pollinose face, dark haired thorax, darker tibiae; front slightly broader; the opaque crossbands on the third and fourth abdominal segments are entire.

MICROLEPIDOPTERA FROM BRITISH COLUMBIA

BY AUGUST BUSCK,
U. S. National Museum, Washington, D. C.

OECOPHORIDAE.

Carcina quercana Fabricius.

Among a large number of Microlepidoptera determined last winter for Mr. E. H. Blackmore of Victoria, British Columbia, were several specimens of this well known European species, hitherto not recognized outside of Europe and Asia Minor.

The species is a striking form both in structure and in color with long thick light yellow antennae reaching beyond the tips of the bright yellow and purple forewings. The larva feeds, according to European records, in a slight web on the under side of *Quercus*, *Fagus* and *Pyrus*.

The genus *Carcina* Hubner, of which *quercana* is the type and the only known species belongs to the family *Oecophoridae* and has the following characters: Forewings 12 veins, 7 and 8 stalked; 7 to termen; 3 and 4 stalked; 2 remote from 3. Hindwings 8 veins; 6 and 7 parallel; 3 and 4 connate. Labial palpi long recurved. Antennae longer than forewings, thickened in the males; basal joint with pecten.

The obvious specific identity of the American specimen with the European has been definitely proven by an examination of the genitalia of specimens from both continents.

Fig. 1—Male genitalia of *Carcina quercana* Fabr.

Agonopteryx blackmori new species.

Labial palpi light ochreous; second joint sparsely sprinkled with black exteriorly; terminal joint with ill defined and incomplete black annulation below apex; brush on second joint short, even and divided. Face light ochreous; head slightly darker; a pink streak below the eyes; thorax light ochreous fuscous with divided reddish yellow posterior tuft.

Forewings light reddish ochreous with paler ochreous basal and costal streak, this latter and the entire apical half of the wing sparsly sprinkled with black; a single small but conspicuous black first dorsal spot; a single small whitish second dorsal spot surrounded by brown and rust-red scales which are continued in an longitudinal streak before the end of the cell; apical and terminal cilia and the extreme edge of the wing dark purple. Hindwings light whitish ochreous. Abdomen light ochreous fuscous; underside sprinkled with black dots. Legs ochreous with dusky tarsal joints; anterior tibiae touched with pink.

Alar expanse: 20 to 22 mm.

Habitat: Victoria, B.C., (E. H. Blackmore).

Type, U.S. Nat. Museum No. 23500; *Cotypes* in the National Collection, Ottawa and that of E. H. Blackmore.

This species was reared by Mr. Blackmore from leaf-rolling larvae on Broom and is named in honor of the collector, who has added considerably to our knowledge of British Columbian Microlepidoptera.

The species is nearest to and very close to the European *Agonopteryx costosa* Haworth, which is also a broom feeder. The genitalia are apparently identical, but they are very similar throughout the genus. The species is the American representative of *A. costosa* but must be retained as distinct. The forewings are much more mottled with black and the rosy color of the apical edge in *A. costosa* is replaced by dark purple in *A. blackmori*.

TORTRICIDAE

Cacoecia victoriana new species

Labial palpi light brown, whitish on the inner side. Face, head and patagia light brown. Thorax yellowish. Forewings light ochreous with dark blackish or burnt brown markings; a large, oblique, transverse, dark fascia from before the middle of costa to tornus broadens out triangularly on the middle of the wing to the end of the cell; a small triangular brown costal spot at apical fourth and the base of costal edge dark brown; the terminal veins indicated by brown scales and the terminal part of the wing faintly irrorated by transverse wavy black lines. These latter, as well as the darker scales on the veins are easily lost in flown specimens which appear dirty ochreous on the apical third of the wing. Hindwing very light ochreous, nearly white. Abdomen dark fuscous above with ochreous underside and anal tuft. Sexes nearly the same size.

Alar expanse: 18 to 20 mm.

Habitat: Victoria and Goldstream, B.C., (E. H. Blackmore).

Type, U.S.N.M. No. 23501; *Cotypes* in collection of E. H. Blackmore.

The species is close to *Cacoecia fractivittana* Clemens and very similar in coloration to the female of this species but smaller and with only slight sexual differences in color and size.

GLYPHIPTERYGIDAE

Hilarographa youngiella new species.

Labial palpi white; second joint brown exteriorly; terminal joint with a longitudinal black line on the underside. Face light silvery fuscous. Head and thorax dark purplish fuscous. Forewings dark purplish brown; five outwardly oblique, silvery white costal streaks; edged with black scales; the two first nearly meet two outwardly oblique dorsal white streaks; between these latter a third less pronounced parallel white streak; before tornus two shorter white dorsal streaks; a central longitudinal line from base of the wing and entire apical half of the wing overlaid with golden yellow, between the apical white streaks, which terminates in faint bluish metallic scales; just above tornus a perpendicular row of four small black dots. Cilia bronzy black with a white spot at apex and a white tuft below apex, giving a sinuate effect to the wing. Hindwings dark bronzy brown. Abdomen dark brown above, underside with a broad silvery transverse band on each segment.

Alar expanse: 12 mm.

Habitat: Departure Bay, B.C., (C. H. Young); Victoria, B.C., (W. Downes).

Type in Canadian National Collection, Ottawa; *Cotype*, U.S. National Museum No. 23502.

Named in honor of my friend C. H. Young, who has added very many new records of Microlepidoptera from Canada and whose exquisitely mounted specimens add charm to any collection.

This is the first record of the Glyphipterygid genus *Hilarographa* Zeller, from North America, but *regalis* Walsingham described as a *Glyphipteryx* is also referable to this genus.

The genus has been considered tropical, ranging from India to Africa and best represented in Central and South America; one species is recorded from Japan. The food plant of *Hilarographa regalis* is *Pinus sabiniana* and I expect the present species also feeds on conifers.

Hilarographa Zeller, of which the Central and South American *H. saxedcriana* Stoll is the type, has the following characters. Labial palpi somewhat flattened, slightly tufted; terminal joint tolerably pointed, about as long as second. Forewing broadly triangular; 12 veins, all separate, 7 to termen, 3 from before the end of the cell, 2 before three-fourths of the cell, 1b furcate at base. Hindwings broader than forewings, triangular rounded, 8 veins, 6 and 7 stalked, 3 and 4 connate.

Male genitalia with 8th segment strongly modified as a covering for the genitalia proper; uncus sharply pointed; aedoeagus long, stout, straight; annulus broadly heartshaped; vinculum narrow.

The genus *Setiostoma* Zeller, type *xanthobasis* Zeller, which was described in this family and which has hitherto been placed close to *Hilarographa* Zeller (according to Meyrick actually a development from it) has no affiliation whatever with this group, but belongs to the family *Stenomidae*, (*not* equal *Xyloryctidae* Meyrick) constituting a typical genus of that family, amply differentiated generically by vein 7 of the forewing to costa, but otherwise with every characteristic of that family. Its wing form and ornamentation indicate that it is probably developed from forms similar to *Stenoma lactis* Busck and *Stenoma orion* Busck.

From the venation and oral characters alone *Setiostoma* may be mistaken for Glyphipterygid, as indeed it has been all along, though careful study of these characters also clearly shows its true relations, but the genitalia give these at once and without doubt.

The genitalia of *Setiostoma* are typical Stenomid in every respect and very different from anything in the *Glyphipterygidae*. The evidence of the genitalia is so clear cut and conclusive that there can be no doubt about the position of the genus. It is one of the very many instances, where the value of the genitalia as an aid in the systematic work becomes apparent to anyone, who will look into the subject even superficially.

YPONOMEUTIDAE

Argyresthia monochromella new species.

Labial palpi dark fuscous. Face golden fuscous. Tuft on head light

reddish yellow, not metallic. Thorax golden fuscous. Forewings unicolored shining golden yellowish fuscous with a slight greenish tint. Hindwings light fuscous with yellowish cilia. Abdomen dark fuscous with yellowish anal tuft. Legs light silvery fuscous.

Alar expanse: 13 mm.

Habitat: Victoria, B.C., (E. H. Blackmore).

Type and *Cotype*, U. S. National Museum No. 23503. *Cotypes* in collection Blackmore.

This striking species may eventually prove to be the only other described N. A. unicolorous species, *A. altissima* Chambers, which was described from Colorado, 11,000 altitude, and the unique type of which I have studied in Cambridge; but aside from the different localities, the present species appears to differ in the strongly yellow head and the more golden metallic color of the forewings and it would be unwarranted to identify it as Chambers' species from present evidence. The present species has veins 7 and 8 of the forewing stalked.

CYGNODOIDEA

Aphelosetia cygnodiella new species.

Labial palpi dark brownish fuscous. Antennae dark brown, basal joint with strong pecten. Head and thorax dark brownish fuscous. Forewing with basal fourth dark fuscous, rest of the wing strongly overlaid with white, the brown appears as irregularly scattered scales; a long blackish brown spot on the middle of the field, a smaller blackish spot at the end of the cell; cilia light fuscous with a blackish brown transverse line near base formed by overlying white black-tipped scales on terminal and apical edges of the wing. Hindwings brownish fuscous with light yellowish fuscous cilia. Abdomen blackish fuscous with small yellowish anal tuft. Legs blackish fuscous.

Alar expanse: 11 mm.

Habitat: Victoria, B.C., (W. Downes).

Type, Canadian National Collection, Ottawa. *Cotypes*, No. 23504 in U. S. Nat. Mus.

The name *Aphelosetia* Stephens must, as shown by Walsingham, be employed for *Elachista* Auctores, type *argentella* Clerk. (Treitschke in part).

The genus belongs to the superfamily *Cygnodoidea* Busck and differs from *Cygnodia* Herr-Sch. in the absence of one dorsal vein of each wing. Vein 7 bis (9) in the hindwing is present in *cygnodiella* Busck, but tends to become obsolete in most of our American species.

NEARCTIC RECORDS FOR SPECIES OF MIRIDAE KNOWN HERETOFORE ONLY FROM THE PALAEARCTIC REGION (HETEROP.)

BY HARRY H. KNIGHT,[1]

University of Minnesota, St. Paul.

During the past few months the writer has been able to obtain a considerable collection of Palaearctic Miridae, besides having opportunity to study a large number of species determined by Reuter and sent to the late Mr. O. Heidemann. The material at hand for comparing Nearctic species with those

[1]Published, with the approval of the Director, as Paper No. 264 of the Journal Series of the Minnesota Agricultural Experiment Station.

*References marked with an asterisk have not been verified in the original.

from the Palaearctic region makes it possible to add nine species to the list of forms common to both regions. Dr. Horvath (1908)[2], in the most important contribution on this subject, records twenty-seven species of Miridae as common to both Palaearctic and Nearctic regions. One of these, *Lygus viridis*, the present writer (1917b)[4] has shown to be different from *viridis* Fallen, and described the form as *Lygus alni*.

In a previous contribution the writer (1917a)[3] recorded three species new to the Nearctic region, gave definite records for two species regarded as doubtful and indicated that *Neobothynotus modestus* Wirtner was in reality *Bothynotus pilosus* (Boheman). The latter opinion has recently been shared by Dr. Bergroth (1920)[5] in a paper where *N. modestus* Wirtner is placed as a synonym of *Bothynotus pilosus* (Boheman), and the species recorded as representing a division of the subfamily Cylapinae.

Of the Palaearctic species recorded from North America a few appear very doubtful and require verification. It has been possible to trace some of the doubtful forms but others are recorded without exact records of specimens, thus it is impossible at the present time to check the determinations. Records for *Cyllecoris histrionicus* (Linn.), *Globiceps flavomaculatus* (Fabr.), and *Macrotylus herrichi* (Reut.) certainly require verification. *Orthotylus diaphanus* (Kirsch.) was recorded by Tucker (1907)[6] on the authority of a doubtful determination by Heidemann. One of these specimens (♂ June, Lawrence, Kans. E. S. Tucker) stands in the Heidemann collection with a determination label by that author which reads "probl. *Orthotylus diaphanus* Kirsch." This form is smaller and has different genital claspers from *diaphanus* Kirschbaum, as determined and figured by Reuter (1883)[7]. The Tucker specimen is most closely related to *translucens* Tucker, but smaller and evidently undescribed.

An examination of European examples of *Reuteria marqueti* Puton and comparison of the genital claspers with those of *Reuteria irrorata* (Say) demonstrates that the two species are not identical. Records for *Oncotylus punctipes* Reuter from North America as based on identifications by Van Duzee and Heidmann, and examined by the writer, refer to *Plagiognathus chrysanthemi* (Wolff). The writer has previously shown that our records for *Mecomma ambulans* (Fallén) refer to *Mecomma gilvipes* (Stal), and the records for *Orthocephalus saltator* (Hahn) may be referred to *Irbisia sp.* and perhaps in part to *Orthocephalus mutabilis* (Fallén).

The present writer is able to account for forty-eight species of *Miridae* which are common to both Nearctic and Palaearctic regions, but of this number he has not seen *Bothynotus pilosus* (Boheman) and *Apocremnus variabilis* (Fallén) Van Duzee.

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[2]1908 Horváth, G., Les Relations entre les faunes Hémiptérologiques de l'Europe et de l'Amérique du Nord. *In* Ann. Mus. Nat. Hung., vi, pp. 1—14.

[3]1917a. Can. Ent., xlix, pp. 248–252.

[4]1917b. New York (Cornell) Agr. Exp., Sta. Bul. 391, p. 608.

[5]1920. Bergroth, E. List of the Cylapinae (Hem., Miridae) with descriptions of new Philippine forms. *In* Ann. Soc. Ent. Ent. Belgique, lx, pp. 67—83.

[6]1907 Univ. Kans. Sci. Bul., iv, p. 58.

[7]1883 Hem. Gymn. Eur., iii, p. 358, pl. 5, fig. 15.

Plagiognathus chrysanthemi (Wolff).

(?)1778 *Cimex femore-punctatus* Goeze, Ent. Beyt., ii, p. 266.
(?)1785 *Cimex femoralis* Geoffroy, *in* Fourcroy, Ent., Paris, i. p. 204.
(?)1788 *Cimex viridescens* Gmelin, Syst. Nat., edn. xiii, p. 2184.
1804 *Miris chrysanthemi* Wolff, Icones Cim., iv, p. 157, t. xv, f. 151.
1807 *Lygaeus viridulus* Fallen, Cim. Suec., p. 90.
1829 *Phytocoris viridulus* Fallen, Hemip. Suec., p. 105.
1834 *Phytocoris viridulus* Hahn, Wanz. Ins., ii, p. 136, f. 221.
1835 *Capsus viridulus* Herrich-Schaeffer, Nomen. Ent., i, p. 50.
1843 *Capsus viridulus* Meyer, Verz. Schw. Rhyn., p. 77. tab. vii f. 2.
1845 *Phytocoris viridulus* Kolenati, Melet. Ent., ii, p. 124.
1848 *Capsus viridulus* F. Sahlberg, Mon. Geoc. Fenn., p. 103.
1852 *Capsus viridulus* Costa, Cim. Regn. Neap. Cent., iii, p. 43.*
1855 *Capsus (Eurymerocoris) viridulus* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p. 258; (Sep.) Rhyn. v. Wiesb., Caps., p 98
1860 *Capsus (Capsus) viridulus* Flor, Rhyn. Livl., i. p. 595.
1861 *Plagiognathus viridulus* Fieber, Eur. Hemip., p. 303.
1865 *Plagiognathus viridulus* Douglas & Scott, Brit. Hemip., p. 401.
1871 *Capsus (Plagiognathus) viridulus* Thomson, Opusc. Ent., iv, p. 448.
1875 *Plagiognathus viridulus* Reuter, Rev. Crit. Caps., [ii], p. 180; Acta Soc. Faun. Fl. Fenn., i, p. 196.
1875 *Plagiognathus viridulus* Saunders, Trans. Ent. Soc. London, 1875, p. 307.
1878 *Plagiognathus viridulus* Reuter, Hem. Gymn. Eur., i, p. 74, t. 4, figs. 5 et 6.
1878 *Lygus viridulus* Snellen v. Vollenhoven, Hem. Het. Neerl., p. 233.
1883 *Plagiognathus Chrysanthemi* Reuter, Hem. Gymn. Eur., iii, pp. 452, 511.
1886 *Plagiognathus viridulus* Puton, Cat. Hem. Palea., edn. 3, p. 61.
1887 †*Oncotylus punctipes* Provancher, Pet. Faune Ent. Can., iii, p. 149.
1888 *Plagiognathus Chrysanthemi* Reuter, Acta Soc. Sci. Fenn., xv, p. 673, No. 285.
1890 *Plagiognathus chrysanthemi* Atkinson, Cat. Capsidae, p. 171.
1892 *Plagiognathus viridulus* Saunders, Het. Brit. Isds., p. 320.
1899 *Plagiognathus Chrysanthemi* Puton, Cat. Hem. Palea., edn. 4, p. 77.
1909 *Plagiognathus chrysanthemi* Oshanin, Verz. Palae, Hem. i, p. 923.
1912 *Plagiognathus chrysanthemi* Jensen-Haarup, Danmarks Fauna, xii, p. 276.
1912 *Plagiognathus Chrysanthemi* Hueber, Jahr. ver. Nat. Wurtt., lxviii, pp. 212, 219.
1912 †*Oncotylus punctipes* Van Duzee, Can. Ent., xliv, p. 322.
1917 †*Oncotylus punctipes* Van Duzee, Cat. Hemip., p. 404.
1919 †*Oncotylus punctipes* Parshley, Can. Ent., li, p. 72.
1920 *Plagiognathus Chrysanthemi* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix No. 2, p. 166.

Specimens examined: MAINE—♂, July 8, 1917, Bar Harbor; ♂ ♀ July 14, 1918, South West Harbor (C. W. Johnson). MASSACHUSETTS—♀ July 8, 1918, Mt. Toby (H. M. Parshley). NEW YORK—♂ July 26, 1916, Ithaca; 14 ♂ ♀ June 23, 6 ♂ ♀ June 30, 5 ♂ ♀ July 5, 16 ♂ ♀ July 7, 1920, Ithaca; 30 ♂ ♀ July 3, McLean (H. H. Knight), breeding on *Chrysanthemum leucanthemum* L. ♂ July 1, ♀ July 5, ♂ July 13, ♂ July 15, ♂ July 20, 1920, Cranberry Lake; 12 ♂ ♀ July 15, 1920 Wanakena (C. J. Drake). ♂ ♀ July 2-3, 1904 McLean. ♂ July 4, Freeville. MANITOBA—♀ "Winnipeg". NOVA SCOTIA—♀ July 19, Annapolis County; ♀ Aug. 14, 1918, Digby County; 3 ♂ ♀ July 4, ♂ July 15, 5 ♂ ♀ Aug. 20, 1916, Smith's Cove (W. H. Brittain). 2 ♂ July 12, ♀ July 31, 1913, Truro (R. Matheson). ONTARIO—♀ July 14, Norway Point, Lake of Bays (J. McDunnough). 2 ♂ 2 ♀ July 1, ♀ Aug. 18, Ottawa (G. Beaulieu). QUEBEC—♂ July 1, ♂ July 3, Montreal, (G. A. Moore). 2 ♀ July 24, Chicoutimi; ♂ July 24, Montreal; ♂ July 26, Rigaud (G. Beaulieu).

The writer obtained the first clew to the identity of this species when nymphs and adults were collected on ox-eye daisy (*Chrysanthemum leucanthemum* L.) at Ithaca, New York, 1920. On finding a Plagiognathus breeding on this European plant the writer thought immediately of *Plagiognathus chrysanthemi* Wolff, and upon returning to the laboratory, turned at once to references of this species and confirmed the identification. More recently the writer has

been able to make a comparison with European material of *chrysanthemi* Wolff and finds our specimens to be identical in all respects.

Psallus alnicola Douglas & Scott.

1865 ‖*Psallus Alni* Douglas & Scott, Brit. Hemip., p. 414. (not Fabricius).
1871 *Psallus alnicola* Douglas & Scott, Ent. Mon. Mag., viii, p. 62.
1875 *Psallus alnicola* Reuter, Bihang Kongl. Sv. Akad. Handl., iii, p. 50.
1875 *Psallus (Ps.) alnicola* Reuter, Rev. Crit. Caps., [ii] p. 167; Acta Soc. Faun. Fl. Fenn., i, p. 183.
1875 *Psallus alnicola* Saunders, Trans. Ent. Soc. London, 1875, p. 305.
1878 *Psallus alnicola* Reuter, Hem. Gymn. Eur., i, p. 126.
1880 *Psallus alnicola* Reuter, Med. Soc. Faun. Fl. Fenn., v, p. 182.
1883 *Psallus alnicola* Reuter, Hem. Gym. Eur., Suppl. I—III. p. 522.
1886 *Psallus alnicola* Puton, Cat. Hem. Palea., edn. 3, p. 60.
1890 *Psallus alnicola* Atkinson, Cat. Capsidae, p. 160.
1892 *Psallus alnicola* Saunders Het. Brit. Isds., p. 315, pl. 29, f. 8.
1909 *Psallus alnicola* Oshanin, Verz. Palae. Hem., i, p. 906.
1911 *Psallus alnicola* Hueber, Jahr. ver. Nat. Wurtt., lxvii, pp. 406, 440.
1920 *Psallus alnicola* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 163.

Specimens examined: NEW YORK—♀ July 26, 1916, Ithaca, on *Alnus rugosa;* ♀ July 27, 1916, McLean (H. H. Knight). MINNESOTA—♂ ♀ Aug. 20, 1920, Beaver Bay (H. H. Knight).

This species was first recognized from an isolated female specimen taken at Ithaca, but in the absence of European material for comparison the writer hesitated to publish the record. Thorough collecting on the same clump of alders at Ithaca, in 1920, failed to produce additional specimens. During the month of August the writer made a collecting trip along the north shore of Lake Superior, having in mind to search for *Psallus alnicola* on alders in that region. The effort was rewarded when the species was found breeding on *Alnus rugosa* at the mouth of Beaver Creek, Beaver Bay, Minnesota, where that small stream empties into Lake Superior. A large series of nymphs and adults were taken, but all from one group of alders which grew at the waters edge. Specimens were found only on branches which received little direct sunlight, and chiefly on the tender growth at the centre of each bush. This requirement of the species indicates that it can breed only under very favorable conditions of humidity and temperature.

Nymphs of the fifth instar are chiefly red, the wing-pads, pronotal disk, antennae, and legs dusky, apices of wing-pads darker; wing-pads, pronotal disk, and dorsal surface of head thickly dotted with small fuscous points and reddish; tibial spines dark, arising from conspicuous black spots; femora dotted with red on ventral surface, a few black points apically, a pair of larger spots on anterior margin and a second pair on the posterior margin near apex.

Megalocoleus molliculus (Fallén).

1829 *Phytocoris molliculus* Fallén, Hemip. Suec., p. 82.
1835 *Capsus molliculus* Herrich-Schaeffer, Nomen. Ent., i, p. 49.
1842 *Capsus molliculus* Herrich-Schaeffer, Wanz. Ins., vi, p. 32, f. 589.
1843 *Capsus molliculus* Meyer, Verz. Schw. Rhyn., p. 78.
1848 *Capsus molliculus* F. Sahlberg, Mon. Geoc. Fenn., p. 103.
1855 *Capsus (Leptomerocoris) molliculus* Kirschbaum, Jahrb. Ver. Nat. Herz. Nassau, x, p. 240; (Sep.) Rhyn. v. Wiesb., Caps., p. 80.
1860 *Capsus (Capsus) molliculus* Flor. Rhyn. Livl., i, p. 611.
1861 *Macrocoleus molliculus* Fieber, Eur. Hemip., p. 321
1865 *Macrocoleus molliculus* Douglas & Scott, Brit. Hemip., p. 387, pl. 12, f. 9.
1871 *Capsus (Oncotylus) molliculus* Thomson, Opusc. Ent., iv, p. 451.
1872 *Macrocoleus Hardyi* Bold, Nat. Hist. Trans. Northumberland and Durham Soc. iv, p. 358*

1875 *Macrocoleus molliculus* Reuter, Rev. Crit. Caps., [ii], p. 145 ; Acta Soc. Faun. Fl. Fenn., i, p. 161.
1875 *Macrocoleus molliculus* Saunders, Trans Ent Soc. London, 1875, p. 297.
1879 *Macrocoleus molliculus* Reuter, Hem. Gymn. Eur., ii, pp. 226, 305.
1883 *Macrocoleus molliculus* Reuter, Hem. Gymn. Eur., Suppl., I—III p. 537.
1886 *Macrocoleus molliculus* Puton, Cat. Hem. Palea., edn. 3, p. 59.
1890 *Macrocoleus molliculus* Atkinson, Cat. Capsidae, p. 152.
1892 *Megalocoleus molliculus* Saunders, Het. Brit. Isds., p. 303.
1899 *Megalocoleus molliculus* Puton, Cat. Hem. Palea., edn. 4, p. 73.
1909 *Megalocoleus molliculus* Oshanin, Verz. Palae. Hem., i, p. 878.
1910 *Megalocoleus molliculus* Hueber, Jahr. ver. Nat. Wurtt., lxvi, pp. 242, 247; (Sep.) Synop. deut. Blindw., ii, p. 282.
1912 *Megalocoleus molliculus* Jensen-Haarup, Danmarks Fauna, xii, p. 264.
1920 *Megalocoleus molliculus* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 157.

Specimens examined: MASSACHUSETTS— ♂ July 16, 1916, ♀ July 28, 1917, Beach Bluff (H. M. Parshley). ♂ July 16, 1916, Beach Bluff (Chris. E. Olsen).

For a considerable period the writer thought this species must belong to the genus *Oncotylus* and not until European specimens of *Megalocoleus* were examined was the identity of the species revealed. Specimens have been compared with a Reuter determination of *Megalocoleus molliculus* and found to be identical. Although Reuter (1883) and Oshanin (1909) separate *Megalocoleus* and *Oncotylus* by the interposition of several genera, the present writer finds considerable difficulty in recognizing any characters which will separate them. Mr. Van Duzee has recently labelled this form as an undescribed species of *Oncotylus*, further indicating the close relationship of these genera.

According to Reuter (1875), the species occurs on *Achillea millefolia* and *Tanacetum vulgare* in Finland.

Orthotylus concolor (Kirschbaum).

1855 *Capsus concolor* Kirschbaum, Jhrb. Ver. Nat. Herz. Nassau, x, pp. 249, 315; (Sep.) Rhyn. v. Wiesb., Caps., pp. 89, 155.
1861 *Orthotylus concolor* Fieber, Eur., Hemip., p. 289.
1865 *Litosoma concolor* Douglas & Scott, Brit. Hemip., p. 340. (in part).
1877 *Orthotylus concolor* Reuter, Ent. Mon. Mag., xiv, p. 128.
1883 *Orthotylus concolor* Reuter, Hemip. Gymn. Eur., iii, pp. 366, 553.
1886 *Orthotylus concolor* Puton, Cat. Hem. Palea., edn. 3, p. 56.
1890 *Orthotylus concolor* Atkinson, Cat. Capsidae, p. 136.
1892 *Orthotylus concolor* Saunders, Het. Brit. Isds., p. 291.
1908 *Orthotylus concolor* Hueber, Jahr. ver. Nat. Wurtt., lxiv, p. 174; (Sep.) Synop. deut. Blindw., ii, p. 156.
1909 *Orthotylus concolor* Oshanin, Verz. Palae. Hem., i, p. 844.

Specimens examined: MASSACHUSETTS– 2 ♂ 3 ♀ July 15 to Aug. 6, 1918, Woods Hole (Chris E. Olsen). These specimens have been compared with European material of *concolor* Kirschbaum and found identical.

In Van Duzee's key[8] to the species of *Orthotylus*, *concolor* Kirsch. runs to *fraternus* Van D., but from that species it apparently can be separated by the genital claspers and character of the pubescence. In *concolor* the head and pronotum are provided with rather long, coarse black hairs, and covered between by much shorter white silky pubescence, the latter also present to some extent on scutellum and basally on hemelytra. Legs and antennae yellowish green; segment 2 becoming brownish black apically, the last two segments more nearly black. Membrane uniformly infuscated, the veins yellowish to dusky.

[8]Proc. Cal. Acad. Sci., ser. 4, vi, 1916, p. 89.

Blepharidopterus angulatus (Fallén).

1807 *Lygaeus angulatus* Fallén, Mon. Cim. Suec., p. 76.
1829 *Phytocoris angulatus* Fallén Hemip. Suec., p. 80.
1835 *Capsus angulatus* Herrich-Schaeffer, Wanz. Ins., iii, p. 75, f. 292.
1840 *Phytocoris angulata* Zetterstedt, Ins. Lapp., p. 272.
1843 *Capsus angulatus* Meyer, Verz. Schw. Rhyn., p. 89.
1845 *Polymerus* (*Blepharidopterus*) *angulatus* Kolenati, Melet. Ent., ii, p. 108.
1848 *Capsus angulatus* F. Sahlberg, Mon. Geoc. Fenn., p. 97.
1855 *Capsus* (*Cyllecoris*) *angulatus* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p 203; (Sep.) Rhyn. v. Wiesb., Caps., p. 43.
1858 *Haetorhinus angulatus* Fieber, Wien. Ent. Monats., ii, p. 313, tab. 6, figs. 8 et 31.
1860 *Capsus angulatus* Flor, Rhyn. Livl., i, p. 449.
1861 *Actorhinus angulatus* Fieber, Eur. Hemip., p. 285.
1865 *Actorhinus angulatus* Douglas & Scott, Brit. Hemip., p. 347, pl. 11, f. 4.
1871 *Capsus* (*Blepharidopterus*) *angulatus* Thomson, Opusc. Ent. iv, p. 437.
1875 *Actorhinus angulatus* Reuter, Rev. Crit. Caps., [iii], p. 122; Acta Soc. Faun. Fl. Fenn., i, p. 138.
1875 *Actorhinus angulatus* Saunders, Trans. Ent. Soc. London, 1875, p. 281.
1883 *Actorhinus angulatus* Reuter, Hem. Gymn. Eur., iii, p. 400, tab. 1, f. 12.
1886 *Actorhinus angulatus* Puton, Cat. Hem. Palea., edn. 3, p. 55.
1890 *Actorhinus angulatus* Atkinson, Cat. Capsidae, p. 132.
1892 *Actorhinus angulatus* Saunders, Het. Brit. Isds., p. 279, pl. 25, f. 10.
1906 *Blepharidopterus angulatus* Kirkaldy, Trans. Am. Ent. Soc., xxxii, p. 128. (Logotype)
1907 *Actorhinus angulatus* Hueber, Jahr, ver, Nat. Wurtt., lxiii, p. 254; (Sep.) Synop. deut. Blindw., ii, p. 120.
1909 *Actorhinus angulatus* Oshanin, Verz. Palae. Hem. i, p. 829.
1912 *Actorhinus angulatus* Jensen-Haarup, Danmarks Fauna, xii, p. 248, f. 151.
1920 *Actorhinus angulatus* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 143.

Specimens examined: NOVA SCOTIA—2 ♀ Aug. 9, 1919, Halifax, (W. H. Brittain). These specimens have been compared with European material of *angulatus* Fallen and found to be identical. Saunders (1875) records this species as common on alders in England.

Due to some lack of agreement among systematic workers as to what constitutes type fixation, there has been some difficulty in deciding upon the generic name under which *angulatus* Fallén should be known. Kolenati (1845) erected *Blepharidopterus* as a subgenus of *Polymerus* Hahn, including under it three species, *collaris* Fallén, *angulatus* Fallén, and *bimaculatus* Herrich-Schaeffer, but without indicating the type. Fieber (1858), overlooking the work of Kolenati, founded the genus *Actorhinus* for *angulatus* Fallén (haplotype), and placed the species *collaris* Fallén (= *errans* Wolff) along with *pallidus* Herrich-Schaeffer in his new genus *Dicyphus* (type not indicated). In the same paper Fieber also placed *bimaculatus* Herrich-Schaeffer, by inference along with several other species, in his new genus *Calocoris*. In this disposal of the species it appears that Fieber did not in any way restrict future type selection for *Blepharidopterus* Kolenati (1845). Kirkaldy (1906) designated *angulatus* Fallén as the type of *Blepharidopterus* Kolenati, and this appears to be the first valid type fixation according to the generally accepted rules (Art. 30, Int. Rules Zool. Nomen.).

Globiceps dispar (Boheman).

1852 *Cyllecoris dispar* Boheman, Ofv. Kongl. Vet.-Akad, ix, p 72.
1860 *Capsus* (*Capsus*) *dispar* Flor, Rhyn. Livl., i, p. 472.
1861 *Globiceps dispar* Fieber, Eur. Hemip., p. 283.
1866 *Globiceps dispar* Douglas & Scott, Ent. Mon. Mag., ii, p. 249.
1867 *Globiceps dispar* Douglas & Scott, Ent. Mon. Mag., iv, p. 48, pl. 1, f. 4. male, fem.

1871 *Capsus (Globiceps) dispar* Thomson, Opusc. Ent., iv, p. 436.
1875 *Globiceps (Kelidocoris) dispar* Reuter, Bihang Kongl. Sv. Vet.-Akad. Handl., iii, p. 29.
1875 *Globiceps (K. [elidocoris]) dispar* Reuter, Rev. Crit. Caps., [ii], p. 120; Acta Soc. Faun. Fl. Fenn., i, p. 136
1875 *Globiceps dispar* Saunders, Trans. Ent. Soc. London, 1875, p. 280.
1883 *Globiceps dispar* Reuter, Hem. Gymn. Eur., iii, pp. 397, 557, pl. 3, f. 1, ♂
1890 *Globiceps dispar* Atkinson, Cat. Capsidae, p. 132.
1892 *Globiceps dispar* Saunders, Het. Brit. Isds., p. 281, pl. 26, f. 2.
1899 *Globiceps dispar* Puton, Cat. Hem. Palea., edn. 4, p. 69.
1900 *Globiceps subalpinus* Strobl, Mitth. Nat. ver. Steiermark, xxxvi (1899), p. 193.
1908 *Globiceps dispar* Hueber, Jahr. ver. nat. Wurtt., lxiv, p. 118; (Sep.) Synop. deut. Blindw., ii, p. 140.
1909 *Globiceps dispar* Oshanin, Verz. Palae. Hem., i, p. 833.
1920 *Globiceps dispar* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 144.

Specimens examined: COLORADO—2 ♂ July 16, 1898, Little Beaver (E. D. Ball). NEW HAMPSHIRE—♀ (brachyp.) July 20, Glen House, (C. W. Johnson). ONTARIO—♀ (macr.) Aug. 7, Parry Sound (H. S. Parish).

The present material has been compared with identifications by Reuter and found to be identical. Uhler's description of *angustatus* fits the male of *dispar* in all particulars except one statement: "callosities ..... with a groove between, which is partly occupied by a blunt carina that runs back to posterior lobe." In so far as the writer can learn, *angustatus* Uhler has not been recognized since the description of the species was published.

Douglas and Scott (1867) record *dispar* as occurring at the roots of grasses in damp places.

Teratocoris paludum J. Sahlberg.

1860 †*Teratocoris antennatus* Flor, Rhyn. Livl., i, p. 433. (in part, not Boheman).
1871 *Teratocoris paludum* J. Sahlberg, Not. Sallsk. Fauna Fl. Fenn. Forh., xi, (1870) p. 291.*
1875 *Teratocoris paludum* Reuter, Rev. Crit. Caps., [ii], p. 12; Acta Soc. Faun. Fl. Fenn., p. 28.
1881 *Teratocoris paludum* J Sahlberg, Meddel. Soc. Fauna Fl. Fenn., vii, p. 46.
1890 *Teratocoris paludum* Atkinson, Cat. Capsidae, p. 38.
1909 *Teratocoris paludum* Oshanin, Verz. Palae. Hem., i, p. 777.
1920 *Teratocoris paludum* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 135.

Specimens examined: ILLINOIS—♀ June 13, 3 ♀ June 23, Chicago (Wm. J. Gerhard), collected at light. MINNESOTA—♂ Aug. 8, 1910, Koochiching County. 10 ♂ ♀ July 6, 2 ♀ July 9, 1921, University Farm, St. Paul (H. H. Knight), collected at light. NEW YORK—♀ July 22, 1920, Conifer (H. Osborn).

The writer has identified *paludum* by description alone but all other Palæarctic species of the genus are at hand for comparison. In general it is certainly poor policy to record Palæarctic species from North America without having the necessary exotic material for comparison, but in the case of *paludum* the structures and color characters are so distinctive there seems to to be little doubt regarding the identity.

According to Reuter (1875), *Teratocoris paludum* lives on *Carex vesicaria* in Finland.

Megaloceraea recticornis Geoffroy *in* Fourcroy

1775 ‖*Cimex linearis* Fuessly, Verz. Schw. Ins., p. 519.* (not Fabricius).
1785 *Cimex recticornis* Geoffroy *in* Fourcroy, Ent. Paris., i, p. 209.
1807 *Miris longicornis* Fallen, Mon. Cim. Suec., p. 108.
1813 *Cimex linearis* Tigny, Hist. Nat. des Ins., iv, p. 287.*
1829 *Miris longicornis* Fallen, Hemip. Suec., p. 129.

1835 *Miris longicornis* Herrich-Schaeffer, Nomen. Ent., i, p. 47.
1835 *Miris longicornis* Herrich-Schaeffer, Wanz. Ins., iii, p. 43, f. 258.
1843 *Miris longicornis* Meyer, Verz. Schw. Rhyn., p. 37.
1852 *Miris longicornis* Costa, Cim. Regn. Neap. Cent., ii, p. 32.*
1852 *Miris megatoma* Mulsant et Rey, Opusc. ent., p. 126.
1855 *Miris longicornis* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p. 192; (Sep.) Rhyn. v. Wiesb. Caps., p. 32.
1858 *Megaloceraea longicornis* Fieber, Wien. Ent. Monats., ii, p. 301. (Haplotype).
1860 *Miris longicornis* Flor, Rhyn. Livl., i, p. 434.
1861 *Megaloceraea longicornis* Fieber, Eur. Hemip., p. 243.
1865 *Miris longicornis* Douglas & Scott, Brit. Hemip., p. 289.
1869 *Megaloceraea longicornis* Puton, Cat. Hemip., p. 21.
1871 *Miris (Megaloceraea) longicornis* Thomson, Opusc. Ent., iv, p. 415.
1875 *Megaloceraea (M. [egaloceraea]) longicornis* Reuter, Rev. Crit. Caps., [ii], p. 6; Acta Soc. Faun. Fl. Fenn., i, p. 22.
1875 *Megaloceraea longicornis* Saunders, Trans. Ent. Soc. London, 1875, p. 260.
1888 *Megaloceraea recticornis* Reuter, Acta Soc. Sci. Fenn., xv, p. 611, No. 207.
1890 *Megaloceraea recticornis* Atkinson, Cat. Capsidae, p. 36.
1890 *Megaloceraea linearis* Bergroth, Ann. Soc. Ent. Fr., for 1890, Bul. p. LXVI.
1892 *Megaloceraea longicornis* Saunders, Het. Brit. Isds., p. 223, pl. 20, f. 6.
1896 *Megaloceraea recticornis* Hueber, Jahrb. ver. Nat. Wurtt., 1, p. 56; (Sep.) Synop. deut. Blindw., i, p. 52.
1899 *Megaloceraea linearis* Puton, Cat. Hem. Palea., edn. 4, p. 57.
1906 *Nostostira (Megaloceraea) longicornis* Kirkaldy, Trans. Am. Ent. Soc., xxxii, p. 144.
1909 *Megaloceraea linearis* Oshanin, Verz. Palae. Hem., i, p. 772.

Specimens examined: WISCONSIN—2 ♀ June 27, 1914, Madison, (S. B. Fracker), on "foxtail". Probably on *Setaria viridis*, a plant which has been introduced from Europe. These specimens have been compared with European material determined by Reuter and found to be identical.

Adelphocoris lineolatus (Goeze).

1778 *Cimex lineolatus* Goeze, Ent. Beytr., ii, p. 267.
1785 *Cimex albinus* Geoffroy *in* Fourcroy, Ent. Paris, i, p. 208.
1800 *Miris laevigatus* Wolff, Icones Cim., i, p. 36, tab. iv, f. 36. (not Linnaeus).
1804 *Miris laevigatus* Panzer, Faun. Germ., fasc. xciii, f. 21. (not Linnaeus).
1807 *Lygaeus chenopodii* Fallen, Mon. Cim. Suec., p. 74.
1829 *Phytocoris Chenopodii* Fallén, Hemip. Suec., p. 77.
1833 *Phytocoris binotatus* Hahn, Wanz. Ins., i, p. 202, f. 103.
1835 *Capsus chenopodii* Herrich-Schaeffer, Nomen. Ent., i, p. 50.
1835 *Phytocoris bipunctatus* Burmeister, Handb. Ent., ii, p. 270.
1840 *Phytocoris binotatus* Blanchard, Hist. Nat. Ins., p. 137, pl. 5, f. 7.
1843 (?) *Capsus brevicollis* Meyer, Verz. Schw. Rhyn., p. 47, t. I, f. 4.
1843 *Capsus chenopodii* Meyer, Verz. Schw. Rhyn., p. 51 .
1845 *Phytocoris Chenopodii* Kolenati, Melet. Ent., ii, p. 113.
1848 *Capsus Chenopodii* F. Sahlberg, Mon. Geoc. Fenn., p. 100.
1852 *Phytocoris bipunctatus* Costa, Cim. Regn. Neap. Cent., iii, p. 260.*
1855 *Capsus (Deracocoris) Chenopodii* Kirschbaum, Jahrb. ver. Nat. Herz. Nassau, x, p. 217; (Sep.) Rhyn. v. Wiesb., Caps., p. 57.
1860 *Capsus (Capsus) Chenopodii* Flor, Rhyn. Livl., i, p. 501.
1861 *Calocoris chenopodii* Fieber, Eur. Hemip., p. 255.
1865 *Deracocoris Chenopodii* Douglas & Scott, Brit. Hemip., p. 325.
1871 *Capsus Chenopodii* Thomson, Opusc. Ent., iv, p. 420.
1875 *Calocoris Chenopodii* Reuter, Bihang Kongl. Sv. Vet.-Akad. Handl., iii,p. 13.
1875 *Calocoris Chenopodii* Reuter, Rev. Crit. Caps., [ii], p. 38; Acta Soc. Faun. Fl. Fenn., i, p. 54.
1875 *Calocoris chenopodii* Saunders, Trans. Ent. Soc. London, 1875, p. 270.
1878 *Lygus Chenopodii* Snellen v. Vollenhoven, Hem. Het. Neerl., p. 189, pl. 13, f. 7.
1879 *Calocoris chenopodii* Distant, Sec. Yark. Miss., Rhyn., p. 10.
1880 *Calocoris chenopodii* var. *implagiatus* Westhoff, Jahresb. Westfal. Prov.-Versamml. Kunst., ix, p. 74.*
1886 *Calocoris Chenopodii* Puton, Cat. Hem. Palea., edn. 3, p. 48.

1887 *Calocoris Chenopodii* Reuter, *in* Imp. Soc. Nat. Sci., xxxix,-Turkestan zool. Investig., ii, pt. v, Hemip. pt. I, p. 6.
1888 *Calocoris lincolatus* Reuter, Acta Soc. Sci. Fenn., xv, p. 632, No. 234.
1890 *Calocoris lincolatus* Atkinson, Cat. Capsidae, p. 73.
1891 *Calocoris lincolatus* var. *bisbipunctatus* Reuter, Ofv. F. Vet.-Soc. Forh., xxxiii, p. 189
1892 *Calocoris chenopodii* Saunders, Het. Brit. Isds., p. 243.
1896 *Adelphocoris lincolatus* Reuter, Hemip. Gymn. Eur., v, p. 222 et 379.
1899 *Adelphocoris lincolatus* Puton, Hem. Palea., edn. 4, p. 60.
1899 *Adelphocoris lincolatus* Hueber, Jahrb. ver. Nat. Wurtt., lv, p. 358.
1904 *Calocoris lincolatus* Distant, Fauna Brit. Ind., ii, p. 451, f. 291.
1906 *Adelphocoris lincolatus* Reuter, Ann. Mus. zool. St. Pet., x, p. 10 et 20.
1909 *Adelphocoris lincolatus* Oshanin, Verz. Palae. Hem. i, p. 681.
1912 *Adelphocoris lincolatus* Jensen-Haarup, Danmarks Fauna, xii, p. 214.
1920 *Adelphocoris lincolatus* J. Sahlberg, Bidrag Kann. Finl. Nat. Folk, lxxix, No. 2, p. 116.

Specimens examined: CAPE BRETON ISLAND—3 ♂ 2 ♀ August 1917, Chéticamp, (F. Johansen). The writer has compared the present material with Reuter determinations of *lincolatus* Goeze, finds that the specimens are structurally identical but pertain to variety *binotatus* Hahn.

Stenodema virens (Linnaeus).

1767 *Cimex virens* Linnaeus, Syst. Nat., edn. 12, i, p. 730.*
1908 *Stenodema virens* Horvath, Ann. Mus. Natl. Hung., vi, p. 5.
1917 *Stenodema virens* Van Duzee, Cat. Hemip., p. 304.

This species was first recorded from America by Horvath (1908) but without definite locality. Van Duzee (1917) was unable to add anything regarding the distribution. Since receiving European specimens of *virens* for comparison, the writer has gone over the available material in the genus *Stenodema* and desires to record the following observations. Both the typical *virens* and the variety *testaceum* are represented.

Specimens examined: ALASKA—♀, "Alaska". COLORADO—♀ June 24, ♀ July 10, 1900, Fort Collins. ♀ July 13, 1901, Palmer Lake. ♂ Sept 19, Buena Vista. ♂ Sept. 20, Gunnison. 2 ♂ July 27, Arapahoe Peak, alt. 9,856 ft. (A. C. Burrill). 2 ♀, "Colorado" (Popenoe). MONTANA—♀ June 20, 1906, Bozeman. 2 ♂ 10 ♀ July 18, Park County; ♂ July 31, Missoula (A. A. Nichol). NEVADA—♀ July, Ormsby County (C. F. Baker). OREGON—♀ September, Corvallis. ♂ ♀ Aug. 17, 1920, Portland, (A. A. Nichol). WYOMING—♂ 6 ♀ July 20-25, 1920, Yellowstone Park (A. A. Nichol).

The writer is quite convinced that *Miris instabilis* Uhler (1875) should be referred to *virens* Linnaeus rather than to *Stenodema vicinum* (Provancher). This view is supported by the fact that the original description and figure given by Uhler, fit *virens* Linnaeus more closely than is true of *vicinum* Provancher. To this it may be added that no specimens of *Stenodema vicinum* (Provancher) have been seen which came from Colorado, while *virens* is apparently rather common.

Orthocephalus mutabilis (Fallén)—At Ithaca, New York, during the last week of June and the first week of July, 1920, the writer took several more specimens of this species, finding them on ox-eye daisy (*Chrysanthemum leucanthemum*) in company with *Plagiognathus chrysanthemi* Wolff. *Mutabilis* was found most abundant on the Cornell University campus and farm land belonging to the College of Agriculture. Mr. J. L. Frank took one specimen July 4, at Owego, New York.

Mailed Saturday, March 25th, 1922.

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